CHINA: TIMBER TRADE AND PROTECTION
OF FORESTRY RESOURCES
The Research Team consists of:

Project Director: Zheng Zhihai
Project Manager: Yang Jijian
Project Members: Liu Can
               Fei Yong
               Chen Jing
               Wang Jian
Table of Contents

1. An overview of China’s forest resources
   1.1. Current status of forest resources
       1.1.1. Forest area
       1.1.2. Forest stock
       1.1.3. Composition of forest resources
   1.2. Major problems with forest resources

2. An Overview of China’s forest-related laws and policies
   2.1. China’s current forest policies
       2.1.1. Major components of China’s current forest policies
       2.1.2. Overall evaluation of the enforcement of existing forest policies
   2.2. Policy concerning protection of natural forest resources
       2.2.1. Background and components of the policy
       2.2.2. Evaluation of the enforcement of the policy
   2.3. Policy concerning turning steep slope farmland into woodlands or grasslands
       2.3.1. Background and components of the policy
       2.3.2 Evaluation of the enforcement of the policy
   2.4. Policy concerning ownership of forestland and trees
       2.4.1 Background and components of the policy
       2.4.2 Evaluation of the enforcement of the policy
   2.5. Development of a legal framework
       2.5.1. Policy components
       2.5.2. Evaluation of the enforcement of the policy
   2.6. Tax policy for the forest sector
       2.6.1 Background and components of the policy
2.6.2. Evaluation of the enforcement of the policy

3. China’s Industrial structure of the forest sector
   3.1. Industrial structure of the forest sector
   3.2. Economic performance of forest-related enterprises

4. An overview of China’s timber market
   4.1. Current status of timber supply capacity
   4.2 Current status of timber demand
   4.3 Regional distribution of the timber market
   4.4. Analysis of the supply and demand in the timber market
   4.5. Price of timber
   4.6. Impact of China’s natural forest protection program on its timber market
      4.6.1. Coverage and magnitude of the natural forest protection program
      4.6.2. Reduction of timber production

5. China’s Imports and exports of forest products
   5.1 General situation
   5.2 Imports and exports of wood products
      5.2.1 An overview of the timber supply and demand in the international market
      5.2.2. China’s foreign trade in timber
      5.2.3. Composition of wood products for import and export
      5.2.4. Trading partners in import and export of wood products
      5.2.5. Import and export of major wood products
      5.2.6. Import price of timber
   5.3. Trade and investment policy concerning forest products
   5.4. Analysis of the import policy for wood products
   5.5. Implications of China’s accession to the WTO for forest resources protection

6. Equilibrium analysis of China’s domestic production and import of timber
   6.1. Analysis of the domestic production and import of timber
6.2. Projection of wood saving and substitution
6.3. Projection for development of man-made forests
6.4. Determination of the equilibrium of domestic production and import of timber

7. Equilibrium analysis of China’s wood product market and ecological protection
7.1. Preliminary analysis of the ecological benefit of natural forest protection programs
7.2. Determination of the equilibrium of wood product market and ecological protection

8. Policy recommendations
8.1. Timber trade and development strategy
8.2. Adopting a flexible trade strategy
8.3. Intensifying development of fast-growing man-made forests
8.4. Using state subsidies to exchange for protection of forest resources
8.5. Paying attention to the potential negative impact of the WTO accession on forest resources protection

References
1. An overview of China’s forest resources

1.1 Current status of forest resources

1.1.1. Forest area

According to an announcement made by the State Forestry Administration (SFA) in June 2000, the land used for forestry in China is 263.395 million hectares, of which forest area is 158.941 million hectares, ranking China fifth in the world after Russia, Brazil, Canada and the United States in terms of forest area. This was founded on the fifth national survey on forest resources (covering the period from 1994 to 1998), following the revised standards for canopy density prescribed by the Rules for Implementation of the Forest Law. However, China’s per capita forest area is only 0.128 hectares, about one fifth of the world average. China’s forest coverage rate is 16.55 per cent, about 60 per cent of the world average.

In comparison with the results of the fourth survey covering the period from 1989 to 1993, forest area has increased by 13.703 million hectares and with an average annual increase of 2.734 million hectares. In comparable terms, net increase in forest coverage rate is 1.43 per cent. Reserved areas for man-made forests are 46.667 million hectares, ranking China first in the world in terms of both growth rate and scale of man-made forests. Man-made forest area has increased by 10.25 million hectares and with an average annual increase of 2.05 million hectares. Net increases of man-made forests accounted for 74.8 per cent of the net increase in forest area. Net increases in economic forests accounted for nearly 50 per cent of the net increase in man-made forests. See details in Tables 1 and 2.

1.1.2. Forest stock

Total growing stock of standing trees nationwide is 12.49 billion cubic meters. Forest stock is 11.27 billion cubic meters, ranking China seventh in the world. However, per capita forest stock is only 9 cubic meters or about one eighth of the world average. In comparison with results of the fourth survey, stocks of live standing trees has increased by 540 million cubic meters and forest stock has increased by 600 million cubic meters, up 4.5 per cent and 5.6 per cent respectively.

Though national man-made forest area is 29.4 per cent of the total forest area, man-made forest stock is only 9.0 per cent of the total forest stock. Average annual growth of forests is 457.525 cubic meters, keeping ahead of the annual average consumption of 370.752 cubic meters.

1.1.3. Composition of forest resources

Categorized by purpose, timber forest area accounts for 77 per cent of the total forest area and 71 per cent of the forest stock. Shelter forests account for 17 per cent of the total forest area and 22 per cent of the forest stock. Fuel wood forests and special-purpose forests respectively account for three per cent of the total forest areas, and one and six per cent of the forest stock.
Categorized by tree species, the proportion of coniferous trees to broadleaf trees is 52 to 48 in terms of forest area, and 56 to 44 in terms of forest stock.

1.2. Major problems with forest resources

China’s forest resources are facing the following major problems:

- **Uneven distribution of forest resources**
  In addition to deficient forest resources, China’s distribution of forest resources is also extremely uneven. Heilongjiang, Jilin, Inner Mongolia, Sichuan and Yunnan have the largest concentration of forests, which accounts for 43.3 per cent of the forest area and 52.4 per cent of forest stock. On the contrary, northwest provinces have very few forests and forest coverage in some areas is less than one percent.

- **Low quality and relatively low stock per unit area**
  China’s standing forest stock is 78.06 cubic meters per hectare, or 68.5 per cent of the world average. Average stock per hectare is 72.5 cubic meters for timber forests and 34.76 cubic meters for standing man-made forests. Average annual growth of standing forests is 3.35 cubic meters per hectare, and standing forest area with canopy density in the range of 0.2 to 0.3 accounts for 20.1 percent of the total standing forest area.

- **Irrational structure of age of stand and insufficient fellable resources**
  Young and middle forests account for 71.1 per cent of the standing forests in China, and 74.4 percent of the timber forests. The logging area of young and middle forests accounts for 78.5 per cent of the total logging area of standing forests, leading to diminishing reserve resources.

- **Tremendous loss of forestland**
  During the interval between the two surveys, 10.81 million hectares of forestland were shifted to other purposes or turned into non-forest land, at an average rate of 2.163 million hectares per year.

- **Increasing consumption of forest stock and excessive logging**
  During the interval between the two surveys, net annual consumption of timber increased by 50.828 million cubic meters to reach 370.752 million cubic meters, 86.79 million cubic meters more than the quota set by the State Council.

Table 1: Results of the National Surveys

<table>
<thead>
<tr>
<th>Surveys</th>
<th>Year</th>
<th>Forest Areas 100 million hectares</th>
<th>Forest Stock 100 million cubic meters</th>
<th>Forest Coverage %</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Survey</td>
<td>1973 – 1976</td>
<td>1.22</td>
<td>87</td>
<td>12.70</td>
</tr>
<tr>
<td>Second Survey</td>
<td>1977 – 1981</td>
<td>1.15</td>
<td>90</td>
<td>12.00</td>
</tr>
</tbody>
</table>
Table 2: Ten Largest Countries in Terms of Forest Area and Stock
(Unit: 100 million hectares, 100 cubic meters)

<table>
<thead>
<tr>
<th>RANKING</th>
<th>Country</th>
<th>Forest Area</th>
<th>Forest Stock</th>
<th>Country</th>
<th>Forest Area</th>
<th>Forest Stock</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RUSSIA</td>
<td>764976</td>
<td>807100</td>
<td>RUSSIA</td>
<td>764976</td>
<td>807100</td>
</tr>
<tr>
<td>2</td>
<td>BRAZIL</td>
<td>566650</td>
<td>88100</td>
<td>BRAZIL</td>
<td>566650</td>
<td>88100</td>
</tr>
<tr>
<td>3</td>
<td>CANADA</td>
<td>247286</td>
<td>71100</td>
<td>CANADA</td>
<td>247286</td>
<td>71100</td>
</tr>
<tr>
<td>4</td>
<td>USA</td>
<td>21247</td>
<td>3100</td>
<td>USA</td>
<td>21247</td>
<td>3100</td>
</tr>
<tr>
<td>5</td>
<td>China</td>
<td>1159112</td>
<td>7100</td>
<td>Zaire</td>
<td>1159112</td>
<td>71100</td>
</tr>
<tr>
<td>6</td>
<td>Indonesia</td>
<td>116196</td>
<td>90100</td>
<td>Indonesia</td>
<td>116196</td>
<td>90100</td>
</tr>
<tr>
<td>7</td>
<td>Zaire</td>
<td>113231</td>
<td>8100</td>
<td>China</td>
<td>113231</td>
<td>8100</td>
</tr>
<tr>
<td>8</td>
<td>Peru</td>
<td>068105</td>
<td>93100</td>
<td>Peru</td>
<td>068105</td>
<td>93100</td>
</tr>
<tr>
<td>9</td>
<td>India</td>
<td>0652431</td>
<td>01100</td>
<td>Columbia</td>
<td>05460</td>
<td>01100</td>
</tr>
<tr>
<td>10</td>
<td>Columbia</td>
<td>05460</td>
<td>01100</td>
<td>Congo</td>
<td>02046</td>
<td>48100</td>
</tr>
</tbody>
</table>

2. An overview of China’s forest-related laws and policies

2.1. China’s current forest policies

2.1.1. Major components of China’s current forest policies

China’s current forest policies have the following components:

1) “Three fixing” for the forestry sector. “Three fixing”, introduced in 1980, means fixing the rights to mountains, hills and forests, fixing of the mountainous areas for private use and fixing of the forest production responsibility system. “Three fixing” is a fundamental policy for protecting forestry and developing the forestry sector. In the early 1980s, the forestry sector faced major problems such as serious deforestation with little afforestation and timber consumption far exceeding planting, mainly because of unclear rights to forests and changeable policies. Consequently, the Chinese Government adopted the “three fixing” policy in order to reverse the deterioration of forests, curb severe deforestation, protect existing forest resources and provide incentives to bring the forestry sector onto a path of healthy growth.

2) Making it a basic national strategy to mobilize the whole population for afforestation and greening the country.

3) Implementing a tenure target responsibility system in at all levels of government.

4) Making great efforts to develop forest ecological environment. In developing the cross-century development strategy, the 15th Party Congress gave priority to afforestation, water conservation, and control of desertification and improvement of biological environment. In order to improve forest ecological environment, the following tasks must be completed: a) do a good job in the key forest ecological environment projects; b) implement projects to protect natural forests, impose a logging ban on natural forests and manage and protect natural forests well; c) plant trees on barren mountains, hills and wasteland and rehabilitate forests and vegetation; and d) reforest and recover vegetation on steep slope farmland in a planned and systematic manner.
5) Integrating biological, economic and social benefits and developing a sound forest ecological system and a well-developed forestry sector.

6) Carrying out reforms of the forest operation system by categories, and setting priorities for the forestry sector by region. The four major regions are: upper reaches of the Yangtze and Yellow rivers; the northern part of the Northwest, North China and the western desert and arid areas of the Northeast; state-owned forest area in the Northeast; and other areas.

7) Giving financial support to the forestry sector and creating a forest funding system to ensure healthy, sustained and steady development of the forest sector.

8) Developing forest-related science and technology and education, vitalizing the forest sector through the use of science and technology and training professional staff specialized in forestry.

9) Intensifying efforts to develop a legal framework for the forestry sector and protecting the legitimate rights and interests of forest farmers and operators.

10) Strengthening research and development of forest products, developing comprehensive and economical use and substitution of timber, reducing consumption of forest resources, and protecting existing forest resources.

11) Implementing comprehensive development of mountainous areas with focus on forest development to bring along economic development, especially economic development of mountainous and forest areas.

12) Deepening reforms of the forest-related economic system, restructuring the forestry sector and establishing a modern corporate system for the forestry sector to meet the needs of a socialist market economy.

13) Further opening of the forestry sector to the outside world, enabling it to actively participate in international competition and developing international cooperation and exchange, improving investment environment and opening up more areas and encouraging more foreign investment in the forestry sector.

2.1.2. Overall evaluation of the enforcement of existing forest policies
1) Enforcement of forest policies
Major changes in China’s forestry policies were witnessed in 1999. In the wake of the devastating floods in 1998, the Chinese Government, as well as society at large, are more concerned with and pay greater attention to ecological and environmental protection. “Improving ecological environment is a long-term strategy concerning survival and development of the Chinese nation, as well as a fundamental measure to prevent natural disasters such as floods and draughts,” noted the Decision of the CPC Central Committee on Some Major Issues Concerning Agriculture and Rural Work passed at the Third Plenary Session of the 15th Party Congress. “We should make great efforts to increase forest
coverage rate and ensure basic rehabilitation of the areas which have suffered soil erosion and are 
suitable for rehabilitation.” The National Program for Ecological Environmental Development issued 
by the State Council in 1998 set a target to basically rehabilitate the mountains and rivers countrywide 
in about 50 years. In the comprehensive rehabilitation measures introduced by the Chinese 
Government in October 1998 for post-flood reconstruction and elimination of the root causes of floods, 
priority was given to blocking of mountains for afforestation and turning steep slope farmlands into 
woodlands or grasslands to recover their vegetation. A decision was made to implement a natural forest 
resources protection program.

In the face of new challenges, a general approach to forest development has been further clarified. 
That is to follow ideas for forestry sector modernization, regard development of a sound forest 
ecological system and a well-developed forestry sector as a goal, give priority to improvement of the 
ecological environment and carry out and deepen reforms focused on operation by category in the 
forestry sector. Focus has been put on eight major tasks:

- Implementing a natural forest resources protection program;
- Strengthening key forest ecological engineering;
- Tightening management of forest resources and forest administration;
- Strengthening tenure target responsibility systems for leading government officials in protecting 
  and developing forest resources;
- Strengthening scientific and technological support to forest projects;
- Carrying out reforms focused on forest operation by category;
- Intensifying development of commercial forests; and
- Tightening enforcement of laws and regulations concerning forestry.

On the whole, China’s forestry policies have been well implemented in the last few years. Logging 
bans on natural forests along the upper reaches of the Yangtze and upper and middle reaches of the 
Yellow River have been followed. State-owned forest zones in the Northeast and Inner Mongolia have 
reduced logging of natural forests significantly. Some provinces and autonomous regions have led the 
efforts to reforest and recover vegetation on steep slope farmland. Logging of forest resources and use 
of forestland for other purposes have been placed under strict control nationwide. Efforts have been 
intensified to protect wildlife resources. Reforms focused on forest operation by category have made 
progress. A legal framework for the forestry sector is being built up, marked by the release of the 
newly revised Forest Law.

2) Major problems in the enforcement of forest policies

Because China’s forestry sector is in a preliminary stage of development, some problems arose in the 
implementation of forest policies and are reflected in the following areas:
• Policies concerning protection of natural forest resources and turning steep slope farmland to woodlands or grasslands are still in the stage of experimentation and lacking in detail. There have been deviations in implementing the policies.

• Policies concerning forest resources and wildlife management have not been strongly enforced. Destruction of forest and wildlife resources remains a serious problem.

• No fundamental breakthroughs have been made in the reforms of China’s forest operation and management systems, somewhat slowing the pace of marketization of the forest sector.

• Taxes and fees remain a heavy burden on the forestry sector and left disincentively to local authorities, enterprises, farmers and especially the private sector to invest in afforestation.

2.2. Policy concerning protection of natural forest resources

2.2.1. Background and components of the policy

In the wake of the devastating floods in 1998, the Chinese Government started to pay great attention to problems such as using forestland for other purposes and deforestation in the areas along the upper and middle reaches of the Yangtze River as well as consequent soil erosion and silting. In August 1998, the State Council issued the Circular Concerning Protection of Forest Resources and Prevention of Deforestation and Reclaiming and Use of Forestland for Other purposes. The Circular stressed that “strict measures must be taken to resolutely stop deforestation and use of forestland for other purposes and to salvage and protect forest resources.” The Circular required an immediate stop to all deforestation activities and strict management of forestland for its specified purpose. In October 1998, the Opinions on Post-Flood Reconstruction, Rehabilitation of Rivers and Lakes, and Building of Water Conservancy Projects issued by the Chinese Government put forth specific ideas about protection of natural forest resources, afforestation, turning steep slope farmland into woodlands or grasslands and recovery of vegetation. In late 1999, Premier Zhu Rongji, on a trip to Sichuan and Yunnan, again requested restriction of cutting natural forests.

In the Government Work Report passed by the Second Session of the Ninth National People’s Congress in March 1999, it was made very clear that “logging of natural forests in areas along the upper and middle reaches of the Yangtze River and Yellow River must be stopped. Limited logging or stop of logging must be imposed on forest areas in the Northeast and Inner Mongolia and other natural forest areas. Deforestation to make farmland and reclamation of land from lakes must be curbed. Land that was reclaimed excessively or from lakes must be turned back into woodlands, grasslands and lakes. Continued efforts should be made to do a good job in post-flood reconstruction. Efforts should be made to carry out large-scale forestation and planting of trees and grass and implement key forest ecological engineering projects and control soil erosion, so as to leave green mountains and clear waters to our future generations.”

The natural forest resources program consists of the following components:

➢ Reducing logging of natural forests;
Shifting surplus loggers to afforestation, forest management and protection and other businesses;

Separating surplus loggers from their enterprises according to related policy.

2.2.2. Evaluation of the enforcement of the policy
From 1998 to 2000, the Chinese Government invested RMB 8.04 billion yuan from issuing state bonds in the protection of natural forest resources and development of commercial forests. The Ministry of Finance earmarked RMB 11.3 billion yuan for forest management and protection, pension pooling for retired loggers, policy and social expenditures and unemployment and social insurance subsidies. The funds were used mostly for programs to protect natural forest resources in areas along the upper and middle reaches of the Yangtze and Yellow rivers and state-owned forest zones in the Northeast and Inner Mongolia. By the end of 1999, good results were achieved in implementing the programs as reflected in the areas below:

- Firm measures have been taken to gradually or immediately stop, or significantly reduce logging in the project areas. Logging of natural forests has been brought to a stop in areas along the upper and middle reaches of the Yangtze and Yellow rivers involving 6.27 million cubic meters, helping protect 23.33 million hectares of natural forest resources in the project area. Logging in the key state-owned forest zones in the Northeast and Inner Mongolia has been reduced by 3.12 million cubic meters, which is 42 per cent of the reduction target of 7.515 million cubic meters, helping protect 28 million hectares of natural forest resources in the project area.

- Law enforcement has been intensified in forest resource protection. Provincial, municipal and autonomous regional governments have taken action by imposing a logging ban and issuing related circulars; sealing up all logging equipment of lumbering enterprises, closing down timber markets in areas affected by the logging ban, blocking off mountains for afforestation, signing contracts with farmers and announcing penalties for violation of the ban. Forest administration, public security, judicial and supervisory organs have joined forces to ensure strict compliance with the ban and protect forests according to law.

- Efforts to recover forests and vegetation have been accelerated with 795,000 hectares of public welfare forests and 36,000 hectares of commercial forests now planted and 4.64 million hectares of mountainous areas blocked off for afforestation. In addition, 517,000 hectares of natural forests have been artificially regenerated and 2.561 million hectares of forests have been tended.

- Proper arrangements have been made for unemployed loggers. As a result of the logging ban, 282,000 workers in the logging business nationwide lost their jobs, including 173,000 in areas along the upper and middle reaches of the Yangtze and Yellow rivers and 109,000 in key state-owned forest zones in the Northeast and Inner Mongolia. Of the total, 111,000 workers were transferred to forest management and protection, 116,000 to public welfare woods, 12,000 to commercial woods, 8,000 to seedling growing, 35,000 to other jobs and 21,000 workers received lump-sum compensation for termination of labour contracts.
Remaining problems are:

- Low availability of funds from state bond issuance and local counterpart funding. In 1999, only RMB 2.2 billion yuan or 66.1 per cent of the planned RMB 3.33 billion yuan from state bond issuance was actually paid up. Paid-up rate of the local counterpart funding was even lower.

- As a result of the logging ban, forest-related enterprises suffered from decreasing income and heavy debts. Many workers and their families live a hard life, due to the absence of a sound social security system.

- Areas affected by the natural forest resources protection program and especially mountainous areas dependant on forest production have suffered a from sharp decline in local revenues and financial support promised by the central government has not arrived in time, which adversely affected their local economic and social development.

- There is room for improvement in project management standards and systems.

2.3. Policy concerning turning steep slope farmland into woodlands or grasslands

2.3.1. Background and components of the policy
According to SFA statistics, China has about 6.067 million hectares of cultivated slope land above latitude 35° N, mostly in the Yangtze and Yellow river basins. Farming on steep slopes is the immediate cause for soil erosion in China. Land in the Jinshajiang and Wujiang river basins was ploughed several times a year. Whenever there is a flood, soil is washed down mountain slopes into the rivers. A survey shows that 78.2 per cent of the silt that goes into the Yangtze River in the Chongqing area comes from farmland on steep slopes. The Chinese Government is paying great attention to rehabilitation of the mountain slopes in the Yangtze and Yellow river basins. On a trip to Shaaxi, Sichuan and Gansu in the summer of 1999, Premier Zhu Rongji called for efforts to “reconstruct beautiful mountains and rivers in the northwest regions”, and instructed that experimention be carried out in these three provinces. The principle he put forth is: to turn steep slope farmland into woodlands or grasslands, compensate farmers with grain, block off mountains for afforestation and contract forestland to farmers.

2.3.2 Evaluation of the enforcement of the policy
Local governments and people in Shaanxi, Sichuan and Gansu attached great importance to the task of turning steep slope farmland into woodlands or grasslands and completed 293,000 hectares within three months. With strong commitments made by the Chinese government, 193 counties in 17 provinces across China launched pilot and demonstration projects aimed at turning steep slope farmland into woodlands or grasslands in 2000. By the end of 2000, 1.363 million hectares of steep slope farmland were turned into woodlands or grasslands. Encouraged by the tremendous benefits generated by the project in terms of rural industrial restructuring, improved biological environment and increased farmers’ income, many provinces joined the program by themselves and completed 429,000 hectares of
land without any central government financing. This has reflected the great enthusiasm of farmers to turn low-yielding farmland into woodlands or grasslands.

Progress made over the last couple of years has proved that the policy to turn steep slope farmland into woodlands or grasslands is a popular policy and its implementation will have a far-reaching impact on the improvement of China’s ecological environment and rural industrial restructuring. However, the task is complicated and involves many parties. There are still problems reflected mainly in the following three areas:

- The government has not set specific standards for providing grain as compensation, which leads to concerns of farmers about whether they will get the grain, and also by local governments about whether state subsidies will exist.
- Fiscal expenditures of local governments have increased as a result of the program to turn steep slope farmland into woodlands or grasslands. As areas affected are mostly poor areas, this has caused difficulty in implementing the program.
- There is a lack of scientific arrangements and effective management with respect to the ratio between shelter and economic forests, with the latter taking a much larger share.

2.4. Policy concerning ownership of forestland and trees

2.4.1 Background and components of the policy
With the deepening of the rural reforms launched after the Third Plenary Session of the Eleventh Party Congress in 1978, the issue of ownership of forestland and trees has been receiving an increasing amount of attention. The Forest Law of the People’s Republic of China (for trial implementation) released in 1979 stipulates that “ownership of forests and trees by the state, collective and individual is protected from encroachment.” In the Decision on Several Issues Concerning Forestry Protection and Development announced in 1981, the Chinese Government made it clear that it is necessary to stabilize ownership of mountain slope land and forests, delimit mountain slope land for private use and implement a forest production responsibility system. The Forest law revised in 1998 further stipulates that “forests, woods and forestland owned by the state and collective, woods owned and forestland used by individuals should be registered and filed by the people’s government above county level, which issue certificates to confirm ownership or right of use. The State Council may authorize department in charge of forest administration under it to register and file forests, woods and forestland in the key forest zones designated and owned by the state, issue certificates and notify local people’s governments concerned. The legitimate rights and interests of owners and users of forests, woods and forestland are protected by law. No organization or individual is allowed to encroach on them.”

2.4.2 Evaluation of the enforcement of the policy
In enforcing the revised Forest Law, some localities started the process of review and re-issuance of forest ownership certificates. In addition to new ways of operation such as individual contracting, joint stock companies, joint forest farms and afforestation by specialized households that emerged over the last few years, some local authorities have auctioned off more barren mountain slopes and extended contract periods in a bid to stimulate afforestation on barren mountain slopes.
Remaining major problems are:

- Cases of encroachment on state-owned forests, woods and forestland and disputes. Ownership of mountain forests are on the rise due to lack of an effective forest ownership protection system.
- Contracts with farmers on afforestation of barren mountains and wasteland are not well protected. Breach of contract has become a serious problem. The long-existing situation of encroachment on forest farmers’ rights and interests has not been fundamentally reversed.

2.5. Development of a legal framework

2.5.1. Policy components

By the end of 1999, major laws and regulations passed and released by the National People’s Congress, approved and released by the State Council, or approved by the State Council and released and enforced by the former Ministry of Forestry include the following:

- Forest Law
- Rules for the Implementation of the Forest Law
- National People’s Congress Decision on Launching a National Voluntary Tree-Planting Campaign
- Measures for Implementation of the National Voluntary Tree-Planting Campaign issued by the State Council
- Law on Protection of Wild Animals
- Regulations for the Implementation of the Law on Protection of Terrestrial Wild Animals
- Regulations for Forest Fire Prevention
- Regulation for Prevention and Control of Forest Diseases and Insect Pests
- Regulations for the Quarantine of Plants
- Measures for the Regeneration and Management of Forest Logging
- Measures for the Management of Natural Reserves for Forests and Wild Animals
- Regulations for the Management of Seeds
- Regulations for the Protection of Wild Plants, etc.

Meanwhile, in line with laws and administrative decrees, the SFA has formulated more than 60 sector regulations, often working in conjunction with other departments under the State Council, dealing with many aspects of the forest sector.

Following the Decision on the Revision of the Forest Law of the People’s Republic of China passed at the Second Session of the Ninth NPC Standing Committee on April 29, 1998, a new set of Regulations
for the Implementation of the Forest Law was drafted in 1999 and submitted to the State Council for approval. In addition, the Rules for the Implementation of the Regulations for the Protection of New Plant Species (Forest Part) and the List of Key Wild Plants Protected by the State (First Group) were released.

2.5.2. Evaluation of the enforcement of the policy

Promulgation of the aforementioned laws and regulations shows that progress has been made in developing China’s legislation governing the forest sector. Law enforcement is being carried out on the basis of facts and law and guided by the principle of “availability of law to follow, abiding by law, strict law enforcement and punishment of violation of law”, specifically:

- Forest administrative departments at all levels have enhanced their understanding of the importance of law enforcement and intensified efforts to enforce the law.

- Law enforcement institutions and staff have been improved. By the end of 1999, there were 1,181 forest public security sub-bureaus, 4,543 forest police substations with approximately 50,000 forest policemen, about 4,000 timber inspection stations set up with provincial government’s approval, more than 37,000 grassroots forest work stations, and about 200,000 forest administrative and law enforcement staff nationwide.

- Overall capacities of the law enforcement staff have been enhanced through training programs and practical work.

- Administrative and law enforcement systems have been improved.

- Administrative supervision for the forestry sector have been tightened, especially in curbing, investigating and punishing cases involving illegal occupation of forestland and protection of wildlife resources. Major progress has been made. In the period of the Ninth Five-Year Plan, China investigated and punished about 500,000 forest-related cases annually, with integrated case investigation and punishment rates in the range of 90 to 95 per cent; about 450,000 people received administrative punishment, and economic losses of more than RMB 300 million were recovered. About 95 per cent of the cases involving illegal logging, severe deforestation and illegal transportation of timber were investigated and dealt with. And about 80 per cent of the cases involving illegal requisition of forestland for other purposes were investigated and dealt with.

The major problems still remaining are: the reorganization of the Ministry of Forestry into the SFA in 1998 has had some negative effects on the enforcement of the regulations issued by the former, with an increase in the number of cases and difficulties in case processing. There is a lack of staff resources responsible for forest-related law enforcement, with obsolete equipment and a need for institutional development in some localities.

2.6. Tax policy for the forestry sector

2.6.1 Background and components of the policy
Taxation for the forestry sector mainly refers to taxes levied on forest products, i.e. native agriculture product tax and value-added tax.

The purpose of the native agriculture product tax is to redistribute production incomes among agriculture, forestry and animal husbandry sectors. Agriculture tax is levied on enterprises, organizations and individuals with incomes from sales of native agriculture products according to the Regulations Concerning the Levy of Agriculture Tax on Native Agriculture Products issued by the State Council on January 30, 1994. Specifically for forest products, an eight-per cent native agriculture product tax is levied on timber and bamboo. The Ministry of Finance and State Taxation Administration have issued supplementary regulations on the levy of tax on sales of timber and bamboo. See the details in Table 3.

Table 3: Tax Items and Rate for Native Product Tax Applicable to Forest Products in China

<table>
<thead>
<tr>
<th>Tax Item</th>
<th>Tax Rate</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timber and bamboo</td>
<td>5%</td>
<td>Applicable to state-owned forest industrial enterprises in the Northeast and Inner Mongolia</td>
</tr>
<tr>
<td>Timber and bamboo</td>
<td>10%</td>
<td>Applicable to average state-owned forest industrial enterprises</td>
</tr>
<tr>
<td>Timber and bamboo</td>
<td>16%</td>
<td>Applicable to state-owned forest farms and nurseries.</td>
</tr>
<tr>
<td>Raw Lacquer and natural resin</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>Natural rubber</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>Medicinal herb, flower, seedling, xyliphyta oil</td>
<td>5% - 10%</td>
<td></td>
</tr>
<tr>
<td>Other forest products, e.g. special local wild weeds, wild fruit, honey, bamboo shoots, palm fibre, twigs of the chaste tree, etc.</td>
<td>5% - 20%</td>
<td>To be determined by provincial government as authorized by the State Council.</td>
</tr>
</tbody>
</table>

Value-added tax is levied according to the Provisional Regulations Governing Value-Added Tax of the People’s Republic of China issued by the State Council on December 13, 1993 and Circular on Taxation of the Forest Sector, 1995 approved by the State Council and issued jointly by the Ministry of Finance and the State Taxation Administration. Timber and bamboo sold by producers are exempt from value-added tax. Timber and bamboo sold through the distribution system are levied a 13 per cent sales tax and enjoy a 10 per cent income tax deduction. Wood- and bamboo-based manufactured products are levied a 17 per cent sales tax. Tax refunds are applicable to remnants (of logging, processing and manufacturing) of state-owned forest enterprises and products that are based on comprehensive use of low quality, small-sized timber.
Fees applicable to the forestry sector include the afforestation fund approved by the Ministry of Finance and former Ministry of Forestry and various fees collected by different departments and local authorities, such as income tax, greening tax, forest fire protection fees, road construction fees, flood prevention funds and poverty alleviation funds, in the range of 10 to 30 different kinds.

2.6.2. Evaluation of the enforcement of the policy
Currently, the level of taxes and fees for the forestry sector nationwide is too high. Collective forest farms in south China in particular have to pay very high taxes and fees that account for 60 to 70 per cent of their sales income. This means that farmers only get 30 or 40 per cent of their timber sales and their profits are negatively affected. There are two major factors contributing to the excessive burden of taxes and fees for forest farmers:

- Various kinds of combined taxes and levies account for more than one third of the sales revenue of timber. Forest farmers get as little as 25 per cent of the sales of timber as profits.

- Dual taxation of native agriculture product tax, i.e. eight per cent of both timber purchase and sales, plus another 10 per cent local tax levied by some local authorities.

Excessive burden of taxes and fees on forest farmers is attributable to some state policies and regulations as well as additional levies by local authorities. It is important to note that some local forest agencies are depending on such levies to supplement their insufficient administrative budget, thus shifting the government’s financial burden onto farmers.

3. China’s Industrial structure of the forest sector
According to SFA statistics, all major economic targets related to the forest sector in the Ninth Five-Year Plan (1996 – 2000) were attained successfully. During the period, China completed afforestation of 24.546 million hectares, 107.4 per cent of the planned target. The 10 major forest ecological engineering projects together completed afforestation of 16.293 million hectares, an increase of 29.5 per cent over that in the Eighth Five-Year Plan (1991 – 1995). There were 9.68 billion trees planted by the population on a voluntary basis and 290.37 million cubic meters of timber were produced, a decrease of 8.6 percent. 2.65 billion pieces of bamboo were produced, an increase of 27 per cent. Production of man-made board reached 61.43 million cubic meters, an increase of 87 per cent. Production of 11 major bamboo products reached 14.45 million tons, an increase of 36 per cent. These basically met the needs for forest products by the economy and population. Investment in the forest sector rose substantially: fixed investment in the forest sector grew by 126 per cent to reach RMB 45.282 billion yuan. Infrastructure investment in the forestry sector grew by 126 per cent to reach RMB 39.49 billion yuan (including bond investment). State investment in forest sector infrastructure grew by 162.8 per cent to reach RMB 19.34 billion yuan.

Productivity in the forestry sector improved during the period of the Ninth Five-Year Plan. Major steps were taken in restructuring management and operational systems, developing a legal framework and readjusting a product mix of the forestry sector, which made significant progress. China’s forestry sector today has the following characteristics:
Regarding ecological and environmental improvement as a major step in the country’s sustainable development strategy, placing it prominently on the agenda and further strengthening forest ecological and environmental construction. The Government has alleviated the severe funding shortage that constrained forestry development over many years by substantially increasing investment in improving forest ecological environment, and ensuring implementation of the ten major forest biological projects, especially those in the Yangtze and Yellow river watersheds and pilot projects to turn steep slope farmland into woodlands or grasslands.

Addressing the relationship giving equal priority to forest resource protection and development consolidating and expanding simultaneously and significantly strengthening protection of forest resources and especially state-owned natural forest resources.

Major adjustments have been carried out in the distribution of productive forces in the forest sector. Implementation of the ten major forest biological projects, natural forest resources protection program and programs to turn steep slope farmland into woodlands or grasslands is shaping up a new pattern for China’s forest biological and environmental construction. The forestry sector is moving away from the traditional production approach to a more intensive and economies-of-scale production approach. Workforce in the forestry sector is shifting from logging to afforestation and other businesses.

Product mix of the forestry sector has undergone adjustments. Products are getting better. The forestry sector is changing from supplying single physical products to supplying a variety of products including forest environmental products to meet the needs of economic growth and common consumers.

Enhanced legal systems and law enforcement are crucial to the protection of forest resources and continuous growth of the forestry sector.

Forestry sector development poses increasing demand for science and technology and requires the latter to play a greater supportive role. Research and development efforts in forestry have achieved new breakthroughs in the areas of high and new technology development and commercial use, and facilitated sustained, fast and healthy growth of the forest sector.

### 3.1. Industrial structure of the forest sector

In 1999, the total output value of the forestry sector amounted to RMB 318.77 billion yuan, accounting for one per cent of the GDP. Its contribution to the 7.1 per cent GDP growth in the year was 0.06 percentage points. In 2000, the total output value of the forestry sector increased by 11.5 per cent over the proceeding year to RMB 355.55 billion yuan.

In 2000, the primary industry (mainly referring to afforestation industry), secondary industry (mainly referring to forest products) and tertiary industry (mainly referring to forest-related services including forest tourism, R&D and education) constituted 67.2, 29.1 and 3.7 per cent of the total output value respectively.
Overall, the forestry sector has shown the following characteristics:

- Growth momentum of the primary industry remained strong.

  In 2000, the primary industry generated an output value of RMB 238.93 billion yuan, an increase of 11.9 per cent over 1999.

- Output value of the secondary industry continued to increase.

  In 2000, the secondary industry generated an output value of RMB 103.46 billion yuan, an increase of 11.2 per cent over 1999. Its industrial structure, regional distribution and ownership structure all experienced changes.

  In terms of the composition of output value, timber and bamboo felling and transportation business, with an output value of RMB 13.6 billion yuan, accounted for 13.2 per cent; wood processing and bamboo, rattan, palm and straw products, with an output value of RMB 51.96 billion yuan, accounted for 57.2 per cent of the total output value of the secondary industry.

  In terms of regional distribution, state-owned forestry zones in the Northeast and Inner Mongolia have kept their absolute advantage in felling and transportation business and timber processing showed great growth potential; felling and transportation in the southwest regions dropped significantly, but forest-related chemical industry remains in a dominant position; collective forest farms in the south are production bases for pulp, paper and man-made board. And large and midsize export-oriented wood processing, furniture manufacturing and forest-related chemical industries are growing rapidly in the southeastern coastal areas.

  In terms of ownership structure, share of the state sector has been falling while that of the non-state sector has risen slightly. State sectors still play a leading role in forest industries, with state-owned enterprises making up 97.9 per cent of the total number of enterprises in the forestry sector. However, its growth is starting to decline. Output value of the state sector as a share of the total output value of the forestry sector dropped from 77.4 per cent in 1998 to 73.4 per cent in 1999 and 73 per cent in 2000, while the share of collective, joint venture, joint stock companies, foreign-invested companies, companies funded by Hong Kong, Macao and Taiwan investors and other enterprises rose from 22.6 per cent in 1998 to 26.6 per cent in 1999 and further to 27 per cent in 2000.

- Tertiary industry has grown slowly with declining shares.

  In 2000, output value of the tertiary industry in the forestry sector amounted to RMB 13.16 billion yuan, an increase of 7.9 per cent over 1998. Its share in the total output value of the forestry sector fell from 5.7 percent in 1995 to 3.7 per cent in 2000.
3.2. Economic performance of forest-related enterprises

- The third industrial survey shows that industrial enterprises in the forestry sector are generally very small. Apart from logging and transportation enterprises, most of the wood processing enterprises are small and midsize. In particular, small enterprises account for 95% in the areas of converted timber, furniture and forest chemicals. The average size of man-made board enterprises is much smaller than those in the developed countries. The size of shaven board enterprises is only 15 per cent of the world average and the size of plywood enterprises is merely one third of the world average.

- Economic performance of forest enterprises in general is not satisfactory
  The forestry sector faces a number of problems from bad assets to liability ratios, mounting debt loads, low liquidity ratio and irrational capital structure. In 1999, total asset contribution rates of large and midsize state-owned enterprises with independent accounting in the forestry sector was 4.2 per cent, with profitability on the low side; their profitability over costs and expenses was 1.2 per cent, and per capita labour productivity was RMB 9,183 yuan, better than 1998 but falling short of the national standard. Forest enterprises nationwide generated net losses of RMB 610 million yuan, 34.4 per cent less than 1998 and 68 per cent of the enterprises are in the red, 1.1 per cent less than 1998.

4. An overview of China’s timber market

4.1. Current status of timber supply capacity
From 1949 to 1998, China’s wood production, including the portion covered by SFA statistics and the portion not covered, was basically on the rise. Statistics from the SFA show that wood production in the period amounted to 2,161.58 million cubic meters, with annual production at an average of 44.11 million cubic meters. The portion of wood production covered by SFA statistics is mainly composed of commodity timber which constitutes effective supply in the market (note: effective supply means the quantity of products supplied and accepted by the market, as distinguished from production), while the portion excluded in SFA statistics mainly refers to the timber consumed by farmers themselves and small quantities of small-sized timber. For this reason, there could be some error if only SFA statistics are used in market analysis.

China’s future capacity for timber supply depends not only on its forest resources but also on its choice of forest policy, national economic development and environmental protection strategy. From the perspective of forest policy and environmental protection, the ten major shelter forest projects launched in the 1970s, especially the natural forest protection program launched in 1998, have a direct impact on effective timber supply. From the perspective of national economic development, enhanced national economic strength has created favourable conditions for intensive development of man-made forests, leading to higher effective timber supply.
4.2 Current status of timber demand

China’s current per capita timber consumption is 0.12 cubic meters. However, per capita consumption rises with economic and social development. An increase of 0.1 cubic meter of per capita timber consumption will raise the total demand by 130 million cubic meters. China’s effective demand for timber by 2010 is projected to be 320 million cubic meters, exceeding supply by 70 million cubic meters. An analysis of this forecast by the Delphi method, based on the current status of forest resources and other objective conditions, also shows that timber supply will fall short of demand by 70 million cubic meters by 2010. Judging by the imports of the 1990s, timber of large diameter and valuable species will account for about 10 to 30 per cent of the short supply. Therefore, given the significant demand for timber of large diameter and valuable species, it is necessary to develop fast growing, high yield forests and also import certain quantities in the future.

4.3 Regional distribution of the timber market

Statistics from the SFA show the proportion of effective timber supply from different forest zones in different periods during 1949 to 1997. Effective timber supply from state-owned forest zones in the Northeast and Inner Mongolia dropped from 77.11 per cent in the recovery period (1949 – 1952) to 32.28 per cent, down by 44.83 percentage points. On the other hand, effective timber supply from other forest zones grew significantly. Effective timber supply from collective forest farms and forest-deficient areas in south China and state-owned forest zones in southwest China, rose by 18.87, 10.65 and 12.37 percentage points respectively. There was no major increase in supply from state-owned forest zones in northwest China. Despite the substantial drop, the effective timber supply from the Northeast state-owned forest zones still accounts for one third of the national effective supply. With implementation of the natural forest protection program, effective timber supply from state-owned forest zones in the Northeast, Inner Mongolia, southwest and northwest will fall significantly. For example, timber production continued to fall from 67.67 million cubic meters in 1995 to 67.10 million cubic meters in 1996, 63.95 million cubic meters in 1997, 59.66 million cubic meters in 1998 and finally to 53.27 million cubic meters in 1999. Effective timber supply from collective forest farms and forest-deficient areas in south China is likely to rise. See Exhibit 1.

Exhibit 1: Shares of Effective Supply from Different Forest Zones, in Different Periods
Where
1 Municipalities directly under the central government
2 Forest-deficient areas
3 Collective forest farms in south China
4 State-owned forest zones in northeast China
5 State-owned forest zones in southwest China
6 State-owned forest zones in northwest China

Exhibit 1 shows the geographical changes in the effective supply of timber, with the share of state-owned forest zones in forest-rich areas falling significantly and the share of forest-deficient plain areas rising. This change is attributable to the following factors:

- Forest recuperation policy and the natural forest protection program introduced by the Government to state-owned forest zones in the Northeast and Inner Mongolia. According to the natural forest protection program, timber production, mainly in state-owned forest zones, will be reduced by 6 million cubic meters each year in 2000 and 2001.

- Rapid development of man-made forests. Areas with deficient forest resources and insufficient effective supply have been vigorously developing man-made forests to meet their own needs, in addition to imports from other areas. Thanks to many years of efforts, significant results have been achieved, strengthening, to some extent, the capacities of these areas in ensuring effective supply. These areas have also become well developed in timber processing. Development of man-made forests has strongly propelled growth of man-made board industry. Hebei, for example, is a province short of forest resources. However, its effective supply of man-made board in 1996 reached 1.61 million cubic meters, ranking first in China. More than 90 per cent of man-made board was produced by private enterprises.
4.4. Analysis of the supply and demand in the timber market

China’s timber market has the following characteristics:

• Supply gap is getting bigger

Results of the fifth survey on forest resources show that net annual consumption of forest stock during the interval was 370 million cubic meters, with average annual increase at 50.82 million cubic meters, as compared with the fourth survey period. Average annual logging in excess of quota was 86.79 million cubic meters. If converted to log equivalent by 65 per cent, total excessive logging amounted to 240 million cubic meters, with average an annual increase of 33.03 million cubic meters.

In 1999, China produced 52.368 million cubic meters of timber. But national timber consumption was estimated at 91.8 million cubic meters, far exceeding domestic supply.

On one hand, fast economic growth has boosted demand for timber. China’s per capita consumption of timber today is 0.23 cubic meters, about 30 per cent of the world average. Building and interior decoration industries are number one consumers and make up about 67.5 per cent of the total timber consumption, followed by furniture, coal and papermaking industries which account for about 26.1 per cent of the total consumption. Stationary and sports articles, chemicals, railway and chemical fibre are next in line. Domestic demand for timber is expected to continue to rise in the Tenth Five-Year Plan period.

On the other hand, given China’s limited forest resources, ongoing natural forest protection programs, significant reduction of logging quotas and imposition of the logging ban, domestic timber supply will continue to decline. China will reduce timber production by 10 per cent each year in the Tenth Five-Year Plan period. Annual timber supply is expected to decrease to less than 40 million cubic meters a year.

• Structural problems between supply and demand are becoming more conspicuous

China faces a prominent structural problem in the composition of its forest resources. As broadleaf trees grow slower than coniferous trees, a lot more coniferous trees than broadleaf trees have been planted in man-made forests. Consequently, reserve resources of broadleaf trees are likely to be insufficient in the coming years. Large and medium diameter timber accounts for 75.9 per cent of the market demand today, while demand for small diameter timber is 24.1 per cent. Domestically, produced large and medium diameter timber, however, only makes up 59 per cent of the total production while share of small diameter timber is as much as 41 per cent, causing an imbalance in supply and demand and insufficient supplies of large diameter, high quality broadleaf timber resources.

Of China’s timber forests, stocks of nearly mature forests declined from 19.6 billion cubic meters in 1993 to 13.5 billion cubic meters in 2000, and are likely to decline further to 8.75 billion cubic meters by 2010. With the exception of poplar, birch and fir, stocks of fellable mature forests is
likely to decline year after year. Large diameter timber resources, in particular, will decline sharply. Since the 1990s, annual imports of timber and related products (log equivalent) have been increasing year after year. Log, converted timber, veneer and plywood board make up 30 per cent of the imports. This is also attributable to China’s shortage of large diameter logs.

• Implementation of the natural forest protection program will put more pressure on the supply-demand balance over a number of years. Most of the trees covered by the program are valuable species and large diameter trees, thus further aggravating the supply gap and structural problems between supply and demand.

To meet market needs for timber, China has the following options:

• Actively taking measures to save and substitute wood with other materials.

• Increasing timber imports.

• In the medium and long term, given the constraints of international timber supply, price and balance of payment, China needs to take the following measures to address the supply-demand problem:

• China should fundamentally accelerate development in forest resources and increase effective supply of timber by expanding the scale of fast growing, high yield woods nationwide, strengthening development of fast growing woods on collective forest farms in south China where water and climate conditions are more favourable, enlarging areas of fast growing woods and intensifying tendering of existing young and middle forests.

• Enhancing utilization rates of forest resources and comprehensive utilization of timber.

• Vigorously developing forest industries that use man-made forests and remnants of forests as raw material.

• Actively seeking access to international forest resources, timber and other forest product markets.

4.5. Price of timber
On the whole, the price of domestic timber has been falling since 1994, despite a slight upturn in 2000. For example, the sales price of timber of state forest farms averaged about RMB 454 yuan per cubic meter in 1995 and dropped to RMB 345 yuan in 1997. Despite the slight upturn in the last couple of years, the price was only RMB 359 yuan per cubic meter in 2000.

The situation in supply and demand of timber affects its price. Timber price tends to rise as a result of short supply. But on the other hand, factors such as timber imports and substitution restrict price from rising.

An analysis of the statistical data from by the State Statistical Bureau indicates that the price of timber rose slightly in 1999, with a yearly average price index of 102.4 or 2.4 per cent higher than in 1998.
But price indexes varied significantly throughout the year, with fluctuation in the range of 18 per cent, mainly due to factors such as monthly variations in timber imports, transportation volume and market demand.

4.6. Impact of China’s natural forest protection program on its timber market

4.6.1. Coverage and magnitude of the natural forest protection program

China started to implement the natural forest protection program in 1998. The program focuses on the upper reaches of the Yangtze River, upper and middle reaches of the Yellow River, state-owned forest zones in the Northeast and Inner Mongolia and 17 provinces, municipalities and autonomous regions from Xinjiang to Hainan.

The upper reaches of the Yangtze River, with the Three Gorges reservoir area as the boundary, involve 414 county or forest bureaus in Yunnan, Sichuan, Chongqing, Guizhou, Hubei and Tibet. The upper reaches of the Yangtze River, with Xiaolangdi reservoir areas as the boundary, involve 58 county/city/district/state forest bureaus in Qinghai, Gansu, Ningxia, Inner Mongolia, Shaanxi, Shanxi and Henan. The total area is 229.11 million hectares. Land used for forestry is 89.54 hectares, of which 40.14 hectares are covered with forests (19.69 million hectares of state-owned forests and 20.45 million hectares of collective forests). Of the land covered with forests, 30.38 million hectares are natural forests and 9.76 million hectares are man-made forests. There are also 22.8 million hectares of woodland and shrubbery land, 1.91 million hectares of forestation land where woods have not grown up, 24.65 million hectares of land without forests and 40,000 million hectares of other forestland.

State-owned forest zones in the Northeast and Inner Mongolia involve four major forest bureaus, 12 local forest bureaus and one county forest bureau in Heilongjiang, Jilin and Inner Mongolia. In Hainan, four bureaus and a number of county-level forest farms are involved. In Xinjiang, two major forest bureaus, 25 counties and four county-level forest farms are involved. These areas have 34.13 million hectares of forestland including 27.86 million hectares of land covered with forests, 3.6 million hectares of land without forests and 80,000 hectares of other forestland.

The total area involved in the natural forest protection program is composed of 123.67 million hectares of land used for forestry, 68 million hectares of forestland including 56.19 million hectares of natural forests, 11.81 million hectares of man-made forests, 23.99 million hectares of woodland and shrubbery land, 3.31 million hectares of forestation land where woods have not grown up, 28.25 million hectares of land without forests and 120,000 million hectares of other forestland. See details in Table 4.
Table 4: Composition of the Areas Involved in Natural Forests Protection Program (Unit: 10,000 hectares)

<table>
<thead>
<tr>
<th>Items</th>
<th>Forestland</th>
<th>Land with Forests</th>
<th>Natural Forests</th>
<th>Man-made forests</th>
<th>Woodland &amp; Shrubbery Land</th>
<th>Young Trees which have not grown into woods</th>
<th>Land without Woods</th>
<th>Other Forestland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>12367</td>
<td>6800</td>
<td>5619</td>
<td>1181</td>
<td>2399</td>
<td>331</td>
<td>2825</td>
<td>12</td>
</tr>
<tr>
<td>Yangtze &amp; Yellow Rivers</td>
<td>8954</td>
<td>4041</td>
<td>3038</td>
<td>976</td>
<td>2280</td>
<td>191</td>
<td>2465</td>
<td>4</td>
</tr>
<tr>
<td>Yangtze River Basin</td>
<td>5514</td>
<td>2869</td>
<td>2280</td>
<td>589</td>
<td>1568</td>
<td>96</td>
<td>981</td>
<td>1</td>
</tr>
<tr>
<td>Yellow River Basin</td>
<td>3440</td>
<td>1145</td>
<td>758</td>
<td>387</td>
<td>713</td>
<td>96</td>
<td>1483</td>
<td>3</td>
</tr>
<tr>
<td>Others</td>
<td>3413</td>
<td>2789</td>
<td>2581</td>
<td>205</td>
<td>119</td>
<td>139</td>
<td>360</td>
<td>8</td>
</tr>
<tr>
<td>Northeast &amp; Inner Mongolia</td>
<td>3169</td>
<td>2644</td>
<td>2439</td>
<td>205</td>
<td>58</td>
<td>137</td>
<td>327</td>
<td>3</td>
</tr>
<tr>
<td>Hainan</td>
<td>46</td>
<td>32</td>
<td>32</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Xinjiang</td>
<td>198</td>
<td>110</td>
<td>110</td>
<td>0</td>
<td>60</td>
<td>1</td>
<td>26</td>
<td>0</td>
</tr>
</tbody>
</table>

Exhibit 2: Reduction of Timber Production as a Result of the National Forest Protection Program, 1997 – 2003 (Unit: 10,000 cubic meters)

4.6.2. Reduction of timber production
Timber production in the areas involved in the natural forest protection program was reduced from 32.046 million cubic meters in 1997 to 29.283 million cubic meters in 1998 and then to 22.757 million cubic meters in 1999, and expected to be reduced to 13.81 million cubic meters in 2000. The target is to cut timber production to 12.151 million cubic meters by 2003, a reduction of 19.895 million cubic meters as compared with 1997 prior to the implementation of the program. See Exhibit 2.
5. China’s Imports and exports of forest products

5.1 General situation

In recent years, imports and exports of forest products have grown rapidly and taken an increasing share in China’s total imports and exports. From 1981 to 1992, imports and exports of forest products accounted for only 2.5 per cent of China’s total imports and exports. By 1999, the share already increased to 4.2 per cent with total import and export value at US$15.23 billion. Exports of forest products in 1999 generated foreign exchange revenues of US$6.38 billion and accounted for 3.3 per cent of China’s total exports. Import value of forest products was US$8.85 billion and accounted for 5.3 per cent of China’s total imports.

Compared with only about US$1.1 billion in the late 1980s, China’s imports of forest products increased seven times to over US$8 billion by the end of the Ninth Five-Year Plan period, placing forest products among China’s current and future leading imports. Of the annual imports of forest products, log imports have been growing especially fast. Import of converted timbers is also growing in response to the needs in the interior decoration market. See Table 5

China’s exports of forest products reached US$30.398 billion in the Ninth Five-Year Plan period, an increase of 48.3 per cent over the Eighth Five-Year Plan period. Its share in the total exports remained stable. Furniture took the lion’s share or about 36 per cent of exports, followed by wooden products, paper, converted timber and man-made board. There was little export of logs due to government restriction.

The general situation of China’s imports and exports of forest product is described below:

- Wood products take the largest share in forest product imports, and growth of import of wood products is much higher than that of non-wood forest products.

  In recent years, China’s imports of forest products have focused on wood products. Imports of wood products as a share of the total imports of forest products have varied in the range of 79 to 86 per cent, while the share of non-wood forest products is only 14 to 21 per cent.

  As a result of the gap between domestic supply and demand and especially impact of the natural forest resources protection programs, imports of wood products rose drastically to a record high of US$7.83 billion or 88.5 per cent of the total imports of forest products. Imports of non-wood forest products were US$1.02 billion or merely 11.5 per cent of the total imports of forest products.

- In forest product exports, the share of wood products is increasing while that of non-wood products is declining.

  Export composition of forest products has undergone gradual adjustments since the 1990s. Exports of wood products has been rising with their share in the total exports of forest products
rising from 36 per cent in 1994 to 56 per cent in 1999 and surpassing exports of non-wood forest products.

In 1999, exports of wood products continued to grow to US$3.57 billion, an increase of 18.9 per cent over 1998. On the contrary, exports of non-wood forest products fell to US$2.81 billion, down 1.5 per cent as compared with 1998.

In addition, China’s forestry sector has seen rapid growth of international cooperation. In the Ninth Five-Year Plan period, China borrowed loans and credits of US$253 million from the World Bank to finance 1.133 million cubic meters of afforestation. Upon completion, the projects were expected to increase forest stock by 150 million cubic meters and fruit production by 2.5 million tonnes. The Forest Resources Development and Protection Project, funded by a World Bank loan of US$185 million, aimed to complete 877,000 hectares of afforestation. The Forest Development in Poor Areas Project, funded by a World Bank loan of US$68 million, aimed to complete 257,000 hectares of afforestation. Through the World Bank-financed afforestation projects, RMB 2.77 billion yuan was invested in developing fast growing, high yield forests for timber supply in the Ninth Five-Year Plan period, an increase of 57.4 per cent over the Eighth Five-Year Plan period. There were 745,000 hectares of fast growing, high yield forests planted, an increase of 2.9 per cent over the Eighth Five-Year Plan period.
### Table 5: Import and Export Value of Major Forest Products, 1993 – 1999 (Unit: US$1,000)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Log</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Export</td>
<td>70900</td>
<td>43181</td>
<td>47156</td>
<td>29296</td>
<td>29473</td>
<td>12459</td>
<td>8007</td>
</tr>
<tr>
<td>Total Import</td>
<td>459041</td>
<td>430371</td>
<td>368372</td>
<td>457780</td>
<td>677029</td>
<td>590091</td>
<td>1248631</td>
</tr>
<tr>
<td><strong>Conifer</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Export</td>
<td>14721</td>
<td>7514</td>
<td>11914</td>
<td>5525</td>
<td>3865</td>
<td>2182</td>
<td>1304</td>
</tr>
<tr>
<td>Import</td>
<td>175178</td>
<td>113235</td>
<td>53300</td>
<td>48522</td>
<td>69360</td>
<td>95474</td>
<td>274828</td>
</tr>
<tr>
<td><strong>Broadleaf</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Export</td>
<td>56180</td>
<td>35670</td>
<td>35242</td>
<td>23771</td>
<td>25609</td>
<td>10277</td>
<td>6703</td>
</tr>
<tr>
<td>Import</td>
<td>283864</td>
<td>317137</td>
<td>315073</td>
<td>409257</td>
<td>607668</td>
<td>503617</td>
<td>973804</td>
</tr>
<tr>
<td><strong>Converted</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Timber</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Export</td>
<td>133007</td>
<td>163987</td>
<td>194659</td>
<td>194156</td>
<td>193422</td>
<td>114983</td>
<td>139375</td>
</tr>
<tr>
<td>Import</td>
<td>153075</td>
<td>145615</td>
<td>149133</td>
<td>180087</td>
<td>268110</td>
<td>348260</td>
<td>661936</td>
</tr>
<tr>
<td><strong>Veneer</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Export</td>
<td>13122</td>
<td>15282</td>
<td>28013</td>
<td>27436</td>
<td>43126</td>
<td>41550</td>
<td>46431</td>
</tr>
<tr>
<td>Import</td>
<td>75401</td>
<td>67677</td>
<td>77207</td>
<td>93604</td>
<td>168360</td>
<td>152635</td>
<td>204976</td>
</tr>
<tr>
<td><strong>Special-</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>shaped</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Board</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Export</td>
<td>10060</td>
<td>18585</td>
<td>38752</td>
<td>58739</td>
<td>51408</td>
<td>41865</td>
<td>82260</td>
</tr>
<tr>
<td>Import</td>
<td>13958</td>
<td>14283</td>
<td>18956</td>
<td>6301</td>
<td>7156</td>
<td>17396</td>
<td>11964</td>
</tr>
<tr>
<td><strong>Plywood</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Board Export</td>
<td>33539</td>
<td>31635</td>
<td>39068</td>
<td>62286</td>
<td>151509</td>
<td>64960</td>
<td>123648</td>
</tr>
<tr>
<td>Import</td>
<td>762163</td>
<td>816257</td>
<td>773676</td>
<td>643835</td>
<td>605492</td>
<td>543617</td>
<td>415837</td>
</tr>
<tr>
<td><strong>Fibre</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Board Export</td>
<td>8991</td>
<td>11041</td>
<td>12881</td>
<td>11081</td>
<td>9146</td>
<td>5983</td>
<td>5339</td>
</tr>
<tr>
<td>Import</td>
<td>42033</td>
<td>54046</td>
<td>59518</td>
<td>70054</td>
<td>105937</td>
<td>134172</td>
<td>206841</td>
</tr>
<tr>
<td><strong>Shaven</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Board Export</td>
<td>803</td>
<td>1353</td>
<td>2798</td>
<td>4694</td>
<td>9266</td>
<td>4727</td>
<td>6854</td>
</tr>
<tr>
<td>Import</td>
<td>13345</td>
<td>9777</td>
<td>11574</td>
<td>19971</td>
<td>28484</td>
<td>29679</td>
<td>50647</td>
</tr>
<tr>
<td><strong>Wood</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product Export</td>
<td>541240</td>
<td>710314</td>
<td>907789</td>
<td>897455</td>
<td>1004967</td>
<td>976654</td>
<td>1214722</td>
</tr>
<tr>
<td>Import</td>
<td>50345</td>
<td>70882</td>
<td>91516</td>
<td>64597</td>
<td>58505</td>
<td>84841</td>
<td>69821</td>
</tr>
<tr>
<td><strong>Furniture</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Export</td>
<td>345347</td>
<td>493472</td>
<td>597905</td>
<td>697902</td>
<td>959138</td>
<td>1084662</td>
<td>1309540</td>
</tr>
<tr>
<td>Import</td>
<td>37576</td>
<td>48228</td>
<td>32668</td>
<td>17453</td>
<td>22510</td>
<td>31487</td>
<td>24816</td>
</tr>
<tr>
<td><strong>Wood</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chips Export</td>
<td>62036</td>
<td>81935</td>
<td>180754</td>
<td>162816</td>
<td>154370</td>
<td>120906</td>
<td>111837</td>
</tr>
<tr>
<td>Import</td>
<td>401</td>
<td>582</td>
<td>395</td>
<td>1419</td>
<td>1029</td>
<td>1234</td>
<td>2525</td>
</tr>
<tr>
<td><strong>Wood</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulp Export</td>
<td>1334</td>
<td>3288</td>
<td>19243</td>
<td>7979</td>
<td>8648</td>
<td>7342</td>
<td>1002</td>
</tr>
<tr>
<td>Import</td>
<td>200824</td>
<td>391958</td>
<td>639490</td>
<td>768167</td>
<td>740830</td>
<td>912340</td>
<td>1403427</td>
</tr>
<tr>
<td><strong>Charcoal</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Export</td>
<td>3605</td>
<td>7212</td>
<td>15365</td>
<td>18275</td>
<td>27009</td>
<td>26181</td>
<td>30323</td>
</tr>
<tr>
<td>Import</td>
<td>197</td>
<td>79</td>
<td>315</td>
<td>126</td>
<td>375</td>
<td>665</td>
<td>593</td>
</tr>
<tr>
<td><strong>Rosin</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Export</td>
<td>136545</td>
<td>131885</td>
<td>130887</td>
<td>159389</td>
<td>135558</td>
<td>141678</td>
<td></td>
</tr>
<tr>
<td>Import</td>
<td>1244</td>
<td>1393</td>
<td>1732</td>
<td>2407</td>
<td>2329</td>
<td>2276</td>
<td></td>
</tr>
</tbody>
</table>


Note: according to the explanations of the China Customs Statistical Yearbook, the sum of the figures may not be the same as the total due to round off.

### 5.2. Imports and exports of wood products

#### 5.2.1. An overview of the timber supply and demand in the international market

Global Balance of Timber Supply and Demand, a report by Robert Hagler of the International Timber Resources Co. concluded that the global shortage of timber will not occur before 2020 and that only regional timber shortage could occur even after 2020. The report states that growth of demand for timber is shifting from North America and Western Europe to Asia, Latin America and Eastern Europe. According to the report, growth of demand for wood products is about 16 per cent per year. Log consumption is expected to increase from 1.5 billion cubic meters in 1997 to 2.6 billion cubic meters by 2030. Available timber supply is expected to increase from 2.6 billion cubic meters in 1997 to 3.2
billion cubic meters by 2030. Major shortages in the next 30 years are expected to occur mainly in Europe, Asia and China.

The evolution, changes and development characteristics of the international timber market are summarized as follows:

- From the end of the World War II to the late 1970s, the world timber supply was ample and stable with low prices. In the early 1980s, the average price of coniferous converted timber and plywood board was only US$35 per cubic meter, while broadleaf converted timber and plywood board cost US$24 per cubic meter.

- In the 1980s, major timber exporting countries adopted the policy of encouraging local manufacturing of forest products for the purpose of job creation and generation of foreign exchange incomes. Consequently, log exports decreased sharply with prices rising.

- Today, countries with large forests have mostly shifted from free trade to a monopoly of forest resources by restricting log exports in various ways and encouraging local processing. In the meantime, those countries dependent on imported logs to supply local industry and exports of forest products have lost their sources of material supply and become importers of forest products. In the area of primary processing of forest products, there is no such case of a country being a major exporter of forest products without an advantage in forest resources.

- In the 1990s, changes in the world log supply became even more complicated. The concept of ecological conservation has received broad-based public support since the 1960s. After the 1990 Survey of Global Forest Resources, the international community became extremely concerned with destruction of tropical forests. Relevant international organizations took political and economic sanctions against increasing deforestation, such as the boycott of tropical timber. Environment has become a top priority in the formulation of forest policy. Business activities related to forest operations have been restricted to a large extent, which has led to major fluctuations in log supplies and price.

Since the United Nations Conference on Environment and Development in 1992, countries have become increasingly concerned with environmental issues and sustainable development of forest resources. There has also been closer connections between international trade in forest products and the environment. This connection is mainly reflected in the following areas:

Criteria and Indicators for Sustainable Management of Forests: The Criteria and Indicators for Sustainable Management of Forests proposed at the United Nations Conference on Environment and Development in 1992 represents a set of criteria designed to ensure ecologically, economically and socially sustainable development of forests worldwide, and determine the appropriate quantities and ways of forest felling on the basis of a range of factors such as the environment, climate, species, ecosystems, social culture and economic benefits in different regions. The certification system includes certification of both the sustainable operation of forests and forest products. The purpose is to build up the connection between “green consumers” and producers.
who seek to improve forest operations and expand market shares for more profits through independent evaluation of forest operations activities. Starting in 2001, forest products without this certification are no longer allowed to be sold in the international market, which will certainly have an impact on the international trade in forest products.

The Convention on International Trade in Endangered Species: This Convention was signed more than two decades ago. In recent years, some “green” organizations or environmentalists supported the initiative of some developed countries to include products made of certain tree species exported by some developing countries in the appendix of the Convention and restricting international trade in those products. At present, the WTO is also conducting similar negotiations. Some of the species have already been included in the Convention, and the list increases every year. This will undoubtedly put constraints on international trade in forest products.

The issue of processing technology of forest products: There is a close connection between the environment and production. Different production technologies vary in their environmental effects. In international trade in forest products, production processes and technologies that are harmful to human health and the environment have been increasingly restricted or replaced by environmentally sound processes and technologies. The environmental impact assessment technology is a way to assess environmental impacts of production is being improved and upgraded. Both ISO14000 and ISO 9000 have clear procedures for assessing environmental impact of production technology.

The environmental regulations affecting international trade in forest products as described above are likely to be further strengthened and have an increasingly deeper impact on the market supply and demand, ways of trade, product mix and price and terms in the international trade in forest products. Therefore, we must pay close attention to the changes in these conditions when we think about China’s future international trade strategy for forest products.

5.2.2. China’s foreign trade in timber

China’s effective timber supply cannot meet its market demand. Since 1981, it has been importing log and man-made board to meet domestic construction and consumer needs every year. In the period from 1981 to 1997, China imported 92.989 million cubic meters of log, with annual imports averaging 5.4699 million cubic meters and accounting for 9.43 per cent of the annual effective supply nationwide. Imports (including man-made board and converted timber) in the 1980s remained above eight per cent (excluding 1981), declined in the early 1990s to below eight per cent, and increased substantially since the implementation of the Ninth Five-Year Plan and natural forest protection program. Chinese customs’ statistics show that China’s annual imports of timber and wood products during the period 1995 to 1998 were 45.80 million cubic meters in log equivalent, more than forecasted in the early years of the Ninth Five-Year Plan, and increasing year after year. In 1999, imports of log and converted timber alone increased by 6 million cubic meters over 1998, topping all major bulk products imported by China. The import value of log amounted to US$1.249 billion and converted timber was US$660 million.
Imports of timber can help mitigate the shortage of domestic timber supply. China has become the world’s second largest importer of forest products after Japan. China now depends on imports of timber and forest products to a considerable extent. It will be difficult to continue with this system for the following reasons:

- China has to pay a lot of its valuable foreign exchange to import timber each year. As timber production is labour-intensive, it should strive to become self-sufficient in the shortest possible time.

- As many countries have recognized the importance of protecting their own forest resources and taken actions like prohibition or reduction of log exports, there is insufficient supply elasticity in the international timber trade. It will become more and more difficult to get timber and forest products as needed.

- While implementing the policy of giving priority to the ecological environment, China needs to vigorously speed up development of man-made forests and make great efforts to plant fast growing, high yield forests, so as to meet its needs through self-sufficiency combined with appropriate imports (for the purpose of improving variety). The Government needs to provide financial and policy incentives. China has a lot of land that can be used for development of fast growing forests. In addition, development of fast growing forests and related processing industries will accelerate establishment of an industrial system for the forest sector. Social benefits can also be achieved through employment of urban and rural surplus workers.

**Exhibit 3: Timber Imports, in Log Equivalent, 1981 – 1999 (Unit: 10,000 cubic meters)**

5.2.3. Composition of wood products for import and export

In 1999, imports and exports of wood products amounted to US$11.4 billion, making up 75 per cent of the total imports and exports of forest products. Paper, making up 62.5 per cent, ranks the first among imported wooden products, followed by log, man-made board and veneer which make up 15.9 per cent and 11.6 per cent of the total imports respectively, followed by sawn timber, wooden products and furniture.

Furniture takes up the largest share, or 36.7 per cent of wooden products for export, followed by wooden products, paper, man-made board, converted timber and log. See Exhibits 4 and 5.

Exhibit 4: Composition of Wood Product Exports, 1999

Exhibit 5: Composition of Wood Product Imports, 1999

5.2.4. Trading partners in import and export of wood products

In terms of imports of wood products excluding paper, the five largest trading partners are: Malaysia at 22.9 per cent, Indonesia at 18.6 per cent, Russia at 9.6 per cent, Germany at 8.7 per cent and Gabon at 6.2 per cent.

In terms of exports of wood products excluding paper, the five largest trading partners are: the United States at 31.1 per cent, Japan at 24.7 per cent, Hong Kong, China at 17.2 per cent, Korea at 4.9 per cent, and Taiwan, China at 4.0 per cent.

5.2.5. Import and export of major wood products
• Paper

In recent years, China’s imports of paper products have been increasing steadily, while exports of paper products are on the decline, with increasing surplus in paper trade.

In 1999, imports of paper products amounted to US$4.89 billion and made up 55.3 per cent of the total imports of forest products and 62.5 per cent of the imports of wood products. Import value of paper and paper products, excluding non-wood pulp paper and related products, was at US$3.19 billion; wood pulp at US$1.4 billion; recycled paper at US$0.25 billion; and printed matter at US$0.05 billion. In comparison with 1998, imports of recycled paper increased by 43.2 per cent; paper and paper products by 10.5 per cent; and imports of wood pulp increased substantially from 2.18 million ton to 3.08 million, up 41.3 per cent. In terms of value, imports of wood pulp mainly came from Canada at 28.4 per cent; Indonesia at 17.6 per cent; Russia at 14.9 per cent; Chile at 14.9 per cent; the United States at 9.7 per cent and Brazil at 5.1 per cent.


• Log

In recent years, China’s imports of logs have been multiplying, while exports are falling. In the Ninth Five-Year Plan period, imports of logs amounted to 32.61 million cubic meters, an increase of 14.48 million cubic meters or 79.9 per cent as compared with 18.13 million cubic meters in the Eighth Five-Year Plan period. In 1999, imports of logs made up 15.9 per cent of the total imports of wood products and amounted to US$1.25 billion, an increase of 108.5 per cent over 1998. Conversely, log exports in the same period fell by 35.7 per cent to only US$80 million. See Table 5.

China imports logs mainly from Russia, Malaysia and African countries. In 1999, log imports from Russia amounted to 4.305 million cubic meters or 42.5 per cent of the total volume of log imports and US$270 million or 21.7 per cent of the total value of log imports. In terms of import value, Malaysia comes second with a share at 19.7 per cent; followed by Gabon at 14.6 per cent; Germany at 9.0 per cent; Equatorial Guinea at 5.6 per cent; Indonesia at 5.6 per cent and Papua New Guinea at 5.1 per cent.

The sharp increase in log imports is attributable to several factors: 1. Implementation of the natural forest resources protection programs that have led to declining timber production; 2. Zero tariff introduced on January 1, 1999; and 3. Expansion of import channels which allow any enterprise with foreign trade the right to import timber.

In addition to substantial increases in log imports, there have also been significant changes in terms of varieties and countries of import. China formerly imported coniferous timber such as American pine, dragon spruce and Chinese hemlock mainly from North America to meet the needs of infrastructure development. With growth of interior decoration, furniture and plywood manufacture, there have been increasing imports of broadleaf timber from the Southeast Asian,
African and Oceanic countries. A species grown in Russia, which is similar to Korean pine and deciduous tree grown in the Northeast forest area in terms of timber quality, of wide diameter, high quality and reasonable price, is very popular in the Chinese market.

- Converted timber

China has seen rapid growth of the imports of converted timber in the last few years, with great variety and high added value. In 1999, imports of converted timber, excluding special shaped board, made up 8.4 per cent of the total imports of wood products and were valued at US$660 million, an increase of 90.1 per cent over 1998. Its import volume was 2.76 million cubic meters, an increase of 63.1 per cent over 1998. Meanwhile, exports of converted timber have been on the rise. In 1999, export value of converted timber was US$140 million, up 21.2 per cent over 1998; and its export volume was 350,000 cubic meters, up 37.4 per cent over 1998.

China imports converted timber mainly from Indonesia and Malaysia, which supply 41.9 per cent of China’s total imports of converted timber, followed by the United States at 12.2 per cent, Germany at 11.8 per cent and New Zealand at 4.8 per cent.

- Man-made board and veneer

On the whole, imports and exports of man-made board as a share of total volume of timber trade have remained relatively stable. Thanks to increased domestic production capacities, varieties and the quality of man-made board in the last few years, man-made board produced in China has gained competitiveness in the international market. However, in comparison with the developed countries, a gap still remains in terms of equipment and technology, product mix and variety and quality of building material and products. Imports of some man-made boards are still necessary to supplement domestic supplies.

Import value of plywood board, shaven board, fibreboard and veneer board was US$420 million, US$50.65 million, US$210 million and US$200 million respectively, and their import volume was 1.04 million, 250,000, 790,000 and 640,000 cubic meters respectively. With the exception of plywood board, imports of other boards have somewhat increased over the previous years.

Export value of plywood board, shaven board, fibreboard and veneer board was US$120 million, US$6.85 million, US$53.39 million and US$46.43 million respectively, and their export volume was 420,000, 17,000, 18,000 and 48,000 cubic meters respectively. With the exception of fibreboard, exports of other boards have increased significantly over the previous years.

- Furniture

With development of the furniture industry and considerable increase in furniture production and quality in the last few years, China’s furniture exports have grown rapidly. Exports of furniture as a share of the total export value of wood products have been on the rise, increasing from 23.6 per cent in 1993 to 36.7 per cent in 1999. Furniture exports in 1999 increased by 20.7 per cent over 1998 numbers to reach US$1.31 billion, and 39 per cent of the increase in wood product exports
was attributable to an increase in furniture exports. Major importers of Chinese furniture are the United States at 48.9 per cent, Hong Kong, China at 22.1 per cent and Japan 10.8 per cent of China’s furniture exports.

In 1999, China’s imports of furniture, valued at US$30 million, fell by 21.2 per cent compared with 1998. Its share in the total import value of wood products was less than one per cent, with trade surplus at US$1.28 billion.

- Wooden products

China’s exports of wooden products have been on the rise in the last few years. In 1999, exports of wooden products reached US$1.21 billion and made up 34 per cent of the total export value of wood products. Major importers of Chinese wooden products are Japan at 29.3 per cent, the United States at 25.4 per cent, Hong Kong, China at 13.1 per cent, United Kingdom at 4.0 per cent and Korea at 3.3 per cent.

China does not import a lot of wooden products. Imports of wooden products in 1999 were only US$70,000, decreasing by 18 per cent compared with 1998.

5.2.6. Import price of timber

The import price of timber has remained basically stable as it is closely related to the stable price in the international timber market. See Table 6. The import price of broadleaf timber is rising, while that of coniferous timber is declining. Their prices are about the same as large diameter and high quality timber produced domestically.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>Conifer</th>
<th>Broadleaf</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993</td>
<td>132.83</td>
<td>111.40</td>
<td>150.49</td>
</tr>
<tr>
<td>1994</td>
<td>129.06</td>
<td>86.95</td>
<td>156.05</td>
</tr>
<tr>
<td>1995</td>
<td>142.46</td>
<td>86.34</td>
<td>160.32</td>
</tr>
<tr>
<td>1996</td>
<td>129.69</td>
<td>74.30</td>
<td>161.61</td>
</tr>
<tr>
<td>1997</td>
<td>151.61</td>
<td>72.60</td>
<td>173.28</td>
</tr>
<tr>
<td>1998</td>
<td>124.38</td>
<td>64.24</td>
<td>150.93</td>
</tr>
<tr>
<td>1999</td>
<td>123.19</td>
<td>60.09</td>
<td>175.07</td>
</tr>
</tbody>
</table>

5.3. Trade and investment policy concerning forest products

The Catalogue of Products Subject to Import and Export Quotas jointly issued by the State Development Planning Commission (SDPC) and Ministry of Foreign Trade and Economic Cooperation (MOFTEC), effective as of January 1, 1994, stipulates that timber, rubber, plywood, wood pulp and ABS resin are subject to import and export quotas. The new Catalogue of Products Subject to Import Quota issued on April 1, 1996 removed quota restriction for timber, wood pulp and ABS resin. The revised Catalogue of Products Subject to Import Quota issued on May 11, 1998 removed import quota
restrictions for forest products. Today there is no non-tariff barrier for the import of timber and related products, although some trade restriction measures remain, such as timber export licensing, import registration, and import and export commodity inspection.

On July 19, 1994, MOFTEC and SDPC jointly issued the Provisional Measures for the Management of Import Products. It stipulates that the state manages imported products according to the Catalogue. The small number of listed bulk raw material and commodities, which are crucial to the national economy and people’s livelihood, monopolistic in the international market and price sensitive, are subject to management by state-authorized companies. That means the state authorizes foreign trade companies with strong managerial ability and quality control to manage those products. Products excluded in the Catalogue can be managed by any enterprise with import and export rights. Of the 12 bulk materials and commodities listed in the Catalogue, forest-related products include natural rubber, log and plywood (excluding veneer and faceplate). On December 1, 1998, MOFTEC removed the requirement of approved companies for timber import and opened the business to all import and export companies with foreign trade rights.

In order to gradually integrate into the international market and encourage import of timber and forest products, China has drastically cut tariff rates several times since April 1, 1996. On January 1, 1999, China cut tariffs again to bring the rate for 49 forest products including log, sleeper, common board and wood pulp from one to three per cent (eight to nine per cent for a few products) down to zero; import tariffs for high-grade board from six to nine per cent down to zero; and tariff for four other wooden products from 18 to 21 per cent down to 10 per cent. China’s accession to the WTO is expected to bring even lower tariff for timber and related products.

On January 1, 2001, MOFTEC released a new Catalogue of Products Subject to Export License that includes log, rosin and pine resin, and converted timber. Converted timber is also listed in the Catalogue of Products for Frontier Trade involving 18 products subject to state regulation.

In order to attract more foreign investors to China, the Government revised the catalogue of industries and sectors open for foreign investment in December 1997. Forest-related areas where foreign investment is encouraged include: reclamation and development of barren mountains, wasteland and beach land; afforestation and introduction of improved varieties; forest chemicals and new technology and products for comprehensive use of lower quality, smaller-sized wood and fuel wood in forest areas; projects aimed at rehabilitation and improvement of ecological environment; pulp (with annual production capacity of more than 170,000 tonnes and simultaneous development of raw material supply base); and manufacture of tree transplanting equipment. In terms of products and technology specifically, selection and breeding of fine strains and improved genes; breeding of economic tree species and fine strains of flowers and preservation; prevention and control of forest disasters; afforestation in ecologically and environmentally vulnerable areas and destitute wasteland; fast-growing, high yield forest; shelter forest projects; forest resources rehabilitation projects; prevention and control of desertification; wood pulp papermaking with material supply base; downstream processing of timber, artificial woods, small diameter timbers and remnants from forest areas and associated products; bamboo-based and plant fibre engineering material; downstream processing of forest chemicals; physiological active substance of trees; new sand-dune fixing, water conservation
and soil improving material; pulp, paper and cardboard, and high speed nine-layer corrugated cardboard of more than nine layers which meet economies-of-scale standard; and natural rubber. The Government provides favourable policy treatment and financial support to investors in the above areas in terms of project approval, credit, taxation, production and distribution.

Forest-related areas in the list of sectors where foreign investment is restricted include: processing and export of valuable tree species (foreign solely-owned venture is not allowed); production of natural perfume; processing of fat or oil; and paper and cardboard (without construction of raw material supply base).

5.4. Analysis of the import policy for wood products

China is confronted with insufficient total supply of timber with an imbalanced structure. This situation is not likely to change in the near future, and, instead, will get worse with growth in demand. China cannot survive without the international market. The comparative benefits for China to participate in international timber trade are as follows:

- **Balance domestic supply and demand.** China is extremely short of fellable forest resources, with very little left by the end of the 20th century. Reserve resources, which can be felled in the short term, are very limited. Especially with the logging ban on natural forests, China has lost the resource base for its traditional forest industry. Import is a major way to make up for the supply gap.

- **Stabilize price.** Price of domestic timber and wood products is rising as a result of short supply. Import is a major instrument in stabilizing price. Take plywood board as an example. Its current price in China’s domestic market is in the range of US$529 to US$588 per cubic meter. With the U.S. export price of plywood board at US$196 per cubic meter, Indonesian export prices at US$323 per cubic meter and the world average price at US$360 per cubic meter, China’s domestic price of plywood board is 47 - 64 per cent higher than the world average.

- **Maintain and increase employment.** Turbulence caused by the logging ban, surplus capacities and unemployment of workers in the forest industry are factors for potential social tension. The import of forest resources will help China make use of the existing capacities and maintain and increase employment.

Major issues faced by China in participating in international timber trade are as follows:

- **Larger trade deficit.** Incomplete statistics show that China’s imports of major forest products in 1999 were equivalent to about 10 million cubic meters of logs, or about US$7 billion, while its export sales of forest products in the same year were less than US$3 billion, with a huge deficit of US$4 billion. The costs of importing forest products were dozens of times more than the state investment in the forest sector. With lower tariffs, imports are likely to continue to grow.

- **Given the changeable international timber market,** it is impossible for China to secure a long-term and fixed channel of supply to meet its needs. Analysis of the long-term trends in the
international timber market indicates that supply will increasingly fall short of demand with rising price. This will negatively affect the terms of trade for China.

- Imports will put more pressure on China’s forest industry. Decrease in total domestic production of forest products will have an impact on the overall development of forest business and forest industry. Extension of the situation over a long period of time will also affect the economic and social development of rural and forest areas and increase pressure on employment in the forest sector.

- Massive imports of logs may also cause deterioration of the forest resources in the exporting countries. Consequently, the costs of import will rise. Trade activities may also trigger political problems. We must pay close attention to such possibilities.

5.5. Implications of China’s accession to the WTO for forest resources protection

After China’s accession to the WTO, tariffs for timber and related products will go down, and non-tariff barriers will be phased out. At present, there are basically no non-tariff barriers for timber and wood products. The remaining trade restriction measures mainly consist of the timber imports licensing system, import registration, import and export commodity inspection and 50 per cent tariff reduction for small border trade transactions.

China’s accession to the WTO will have a positive impact on its effort to protect forest resources. Increased imports of timber and wood products will help mitigate the supply shortage, avoid predatory exploitation of forests and facilitate protection and development of forest resources, in order to achieve a balance between consumption and growth of resources, given the slow growth of forests, accelerate the implementation of major forest programs and improve the ecological environment.

In addition, imports of some species and large quantities of logs and wood products as well as wooden packaging that comes with increased imports of goods will put ever-greater pressure on China’s inspection and quarantine work. It was reported by the inspection and quarantine agencies that more than 100 kinds of insects had been found in the logs and wooden packaging imported from about 20 countries and regions in the first half of 2001. Some insects already spread to some extent and harmed the crops. This is a negative impact on the protection of forest resources. China should study the issue as soon as possible and take appropriate policy measures.

6. Equilibrium analysis of China’s domestic production and import of timber

6.1. Analysis of the domestic production and import of timber

Total timber supply means domestic timber production plus imports minus exports. Earlier analysis projects the shortage by 2010 to be about 70 million cubic meters. This shortage can be made up in three ways: saving and substitution; development of man-made forests; and increasing imports.
Figure 6 shows the relationship between China’s timber imports, domestic production and domestic effective supply of timber over the last two decades.

Figure 6: Timber Imports and Domestic production by China, 1981 – 1999
(Unit: 10,000 cubic meters)

Where
1: Timber import equivalent
2: Domestic timber production
3: Total effective supply of timber

6.2. Projection of wood saving and substitution

Wood saving and substitution are important approaches in addressing the shortage of timber supply. New materials and technology have facilitated development of wood saving and substitution. Time series regression equations established for wood saving (sm) and substitution (dm) are:

\[ sm = 248.9355 + 10.83149t \ (R^2=0.827767, F=67.28535) \]
\[ dm = 182.0728 + 73.21291t \ (R^2=0.921833, F=165.1028) \]

Both of them passed (95 per cent) the significant test. Table 7 shows the projections of the quantities of wood saving and substitution from 2001 to 2010 made through the aforesaid regression.

Table 7: Projections of the Quantities of Wood Saving and Substitution for China
(Unit: 10,000 cubic meters)

<table>
<thead>
<tr>
<th>Year</th>
<th>Savings (sm)</th>
<th>Substitution (dm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>476.3968</td>
<td>1719.544</td>
</tr>
<tr>
<td>2002</td>
<td>487.2283</td>
<td>1792.757</td>
</tr>
<tr>
<td>2003</td>
<td>498.0598</td>
<td>1865.971</td>
</tr>
<tr>
<td>2004</td>
<td>508.8913</td>
<td>1939.183</td>
</tr>
</tbody>
</table>
Progress in wood saving and substitution mainly depends on the price ratio between wood and other products. If the price of wood is higher, the progress of saving and substitution will be faster and vice versa. At present, the overall price level of wood is falling, and, consequently, the progress in wood saving and substitution is slow.

### 6.3. Projection for development of man-made forests

In line with the principle of forest operation by categories and based on the species, types of forests, age structure and regional distribution of forest resources, it is estimated that China has six to eight million hectares east of the 400 millimetres isohyets that are suitable for the cultivation of fast-growing forests. Information from relevant national plans indicates that China has about 10 million hectares of land for development of fast-growing forests from 2000 to 2015, mostly in the Northeast forest area (including state-owned forest zones in eastern Inner Mongolia), lower- and middle-reaches of the Yellow River (including the Huai River basin) and collectively-owned forest zones in the south (including Simao Forest Zone in Yunnan Province). Please see Table 8. Production of fast growing forests is expected to reach 1,000 billion cubic meters by 2010.

<table>
<thead>
<tr>
<th>Year</th>
<th>Foreland</th>
<th>Live Standing Stock</th>
<th>Total</th>
<th>Existing</th>
<th>Fast-Growing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Forests</td>
<td>Forests</td>
</tr>
<tr>
<td>2005</td>
<td>519.7228</td>
<td>2012.396</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>530.5542</td>
<td>2085.608</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>541.3857</td>
<td>2158.608</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>552.2172</td>
<td>2232.034</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>563.0487</td>
<td>2305.247</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>573.8802</td>
<td>2378.46</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 6.4. Determination of the equilibrium of domestic production and import of timber

If timber output rate of fast-growing forests is 50% to 60%, the newly planted fast-growing forests will increase effective supply by 50 to 60 million cubic meters, which, combined with savings and substitution of about 30 million cubic meters, will be sufficient to offset the supply shortage of 70 million cubic meters. On the basis of the above calculation, a balance between domestic timber supply and demand on the whole can be attained by 2010. However, attention needs to be paid to two points:
Development of fast-growing forests, from tree planting to harvesting, takes about five to ten years. Therefore, effective supply cannot be achieved in the short term. We still need to rely on imports for some time. With development of fast-growing forests and increased timber substitution, China will see a decline in imports of timber and wood products.

In terms of structure, China has little problem with the supply and demand of small- and medium-diameter timber, and its price is falling. But large-diameter and high quality timber is in short supply. The need for such timber is estimated at about three to five million cubic meters a year. Therefore, China’s annual timber imports are expected to be in the range of three to five million cubic meters up to 2010. With targeted cultivation of man-made forests, the price of domestically produced large-diameter and high quality timber will become more competitive and imports are likely to go down.

7. **Equilibrium analysis of China’s wood product market and ecological protection**

7.1 **Preliminary analysis of the ecological benefit of natural forest protection programs**

Protection of natural forests can reduce soil erosion. Assuming that soil erosion is about 4,000 tonnes per kilometre per year on average, and soil erosion of forestland per unit area is reduced by 90 per cent as compared with land without forests, with each tonne of eroded topsoil containing 1.0 kg of nitrogen, 0.7 kg of phosphorus and 4.0 kg of potassium, then the natural forests in the areas involved in the natural forests protection program will reduce soil erosion by 1.505 billion tonnes containing 1.505 kg of nitrogen, 1.053 billion kg of phosphorus and 6.018 kg of potassium per year. Assuming that natural forest can contain 600 ton of water per hectare, then the natural forests involved can contain 25.078 billion tonnes of water.

According to the studies by the Research Institute of Ecology, Chinese Academy of Sciences, after purification by the ecosystem of forests, nitrate nitrogen contained in a litre of rainwater will be reduced by 0.068 mg, ammonium nitrogen by 0.056 mg, potassium by 0.20 mg, manganese by 0.031 mg, copper by 0.003 mg, and zinc by 0.68 mg. While water dissolved matter washed down from slopes without forests is 16.9 tonnes per hm2, water dissolved matter washed down from slopes covered with forests is 6.40 tonnes per hm2. The underground water in the area with forests contains zero cadmium and 0.047 µg/L of lead; the underground water in the cutover contains 0.047µg/L of cadmium and 4.12µg/L of lead; and the underground water in area without forests contains 0.17µg/L of cadmium. The natural forests involved in the protection program can absorb 439 million tonnes of dissolved matter per year. Given that a hectare of forests can absorb 748 tonnes of SO2, 0.38 tonnes of nitrogen oxide and 2.2 tonnes of CO, the natural forests involved in the protection program can absorb 31.263 tonnes of SO2, 15.88 million tonnes of nitrogen oxide and 91.95 tonnes of CO.

7.2. **Determination of the equilibrium of the wood product market and ecological protection**

38
China supports the regions involved in natural forests protection programs through transfer payment and financial assistance. With the help of equilibrium analysis of the ecological and environmental benefits, we can compare the regions involved in natural forests protection programs and those regions without such programs to determine how much the government should subsidize other operators for the implementation of the programs to ensure equilibrium of the two. The natural forests protection programs were launched to limit the logging quantities and consequently have a negative impact on forest enterprises and other operators. To convince forest operators to implement the measures related to the natural forests protection programs, we have to ensure that their economic benefits are not less than the profits they can get from the logging of forest resources. This assumption can help us determine how to calculate the equilibrium point between ecological protection and economic benefits. Based on related economics principles, a quantitative model of benefits by diameter class for the natural forests protection programs can be established as follows:

\[
\begin{bmatrix}
F_{cvi}(t+1) & f_{vi}(t+1) & f_{ci}(t+1) \\
F_{cv}(t+1) & f_{c}(t+1) & f(t+1)
\end{bmatrix},
\]

The matrix in formula 1 is:

\[
\begin{bmatrix}
F_{cv}(t+1) & f_{c}(t+1) & f(t+1) \\
0 & F_{2}(t+1) & 0 \\
0 & 0 & F_{3}(t+1)
\end{bmatrix}
\]

Where:

- \(F_{cvi}(t+1)\) represents the value of forest and wood of diameter class “i” at the time “t+1”;
- \(f_{cv}(t+1)\) represents the forest value vector at the time “t+1”;

And the total forest value at the time “t+1” is:

\[
T_{fcv}(t+1) = c^{T}f_{cv}(t+1)
\]

In a market economy, operators always seek maximization of economic benefits. Given the uniqueness of forest resources, the state intervenes in forest production for the long-term and social benefits of the country and compensates the operators for their losses in order to accomplish certain objectives. Assuming that the compensation provided to operators by the state in a certain region is \(GS(t-m)\). For the convenience of computer processing, formula (4) is changed to the following:

\[
F(t+1) = \begin{bmatrix}
F_{1}(t+1) & 0 & 0 & \cdots & 0 & \cdots & 0 \\
0 & F_{2}(t+1) & 0 & \cdots & 0 & \cdots & 0 \\
0 & 0 & F_{3}(t+1) & \cdots & 0 & \cdots & 0 \\
0 & 0 & 0 & \cdots & F_{4}(t+1) & \cdots & 0 \\
0 & 0 & 0 & \cdots & 0 & \cdots & F_{5}(t+1)
\end{bmatrix}
\]

From formula 4, we can get the income matrix for harvesting at the time “t+i” as follows:

\[
W_{1}PV(t+i) \quad W_{1}(t+i)P(t+1)
\]

The income matrix for thinning at the time “t+i” is:

\[
W_{2}PV(t+i) \quad W_{2}(t+i)P(t+1)
\]

The income matrix for harvesting and thinning at the time “t+i” is:

\[
WPV(t+i) \quad W_{1}PV(t+i) \quad W_{2}PV(t+i) \quad W_{1}(t+i) \quad W_{2}(t+i) \quad P_{v}(t+1)
\]
Total income for harvesting and thinning at the time “t+i” is:
\[ TWPV(t+i) = e^{rTWPV(t+i)} \]

The target function of the wood producer is:

\[
\max_{i=0}^{k} \left\{ \sum_{i=0}^{k} \left[ TWP(t+i)(1+r)^i \right] \right\}
\]

Where “r” represents the discount rate.

Constraint conditions

\[ Fv(t+1) \leq \Theta(Fv(t-m),U(t-m),W(t-m))^T \]

For any one year during the operating period:

\[ \sum_{i=0}^{n} \left( W_{1i}(t+i) W_{2i}(t+i) W_{3i}(t+i) \right) \leq \sum_{i=0}^{n} \sum_{j=0}^{n} (b_{ij}(t+i) d_{ij}(t+i)) \]

Where:

“B – D” refers to increments of forest resources from the initial period to the end period of operation.

The implication of the target function lies in the maximization of the net present value sought by operators including harvesting and thinning,, state compensation and incremental value of forest resources.

“GSVt” refers to the logging quotas set by the government departments responsible for forestry administration for specified operators in specified regions, which is smaller than the fellable quantities as well as the quantities that operators intend to fell. For this reason, the state needs to give financial compensation to the operators.

(9) reflects the dynamic changes in forest resources;

(10) reflects that the logging quantity is smaller than the growing quantity;

(11) reflects that the quantity of thinning, logging and loss of forests are smaller than the state-set value;

(12) reflects that the state-set value is smaller than the growing quantity of forests.
Wood can be used for many purposes. With introduction of market mechanisms and development of effective competition, retrofits starting from either logs or other products should result in the same forest price. On this basis, a price equilibrium model of wood products is established as follows:

\[
\begin{align*}
\text{Ps}(t+1) &= \text{P}(t) \delta(t) \Delta x \\
\text{Pd}(t+1) &= \text{P}(t) \theta(t) \Delta y \\
\text{Lim}_{t \to \infty} \left[ \text{D}(t+1) \text{S}(t+1) \right] &= 0 \\
\text{Lim}_{t \to \infty} \left[ \text{Ps}(t+1) \text{Pd}(t+1) \right] &= 0 \\
\text{D}(t+1) &= a \beta \text{Pd}(t+1) \\
\text{S}(t+1) &= a_1 \beta \text{Ps}(t+1)
\end{align*}
\]

Where: \(\text{D}(t+1)\) and \(\text{S}(t+1)\) represents the demand and supply of wood products at the time \((t+1)\); \(\text{Ps}(t+1)\) and \(\text{Pd}(t+1)\) represents the price of supply and demand at the time \((t+1)\); \(\text{P}(t)\) represents the equilibrium price of supply and demand at the time \(t\).

\(\delta(t)\) and \(\theta(t)\) represent the expectation coefficients for producer and consumer respectively. If \(\delta(t) \geq 0\), it means that the expectation coefficients for producer and consumer continue to change in the same direction; and if \(\delta(t) < 0\), it means that the expectation coefficients for producer and consumer continue to change in the opposite direction. \(\alpha\) and \(\beta\) represent the parameter of state intervention in timber production and consumption. \(\Delta x\) and \(\Delta y\) represent the extent of state policy intervention in the production and consumption of wood products (e.g. China’s imposition of logging quotas is one of the policy interventions in the production and consumption of wood products, and the extent of the changes in the equilibrium price of supply and demand of wood products at the time \(t, t-1\), expressed as:

\[
\Delta \text{P}(t) = \text{P}(t-1)
\]

is the price formula for wood producer.

is the price formula for wood consumer.

is the price equilibrium formula for the supply and demand of wood products.

is the equilibrium formula for the supply and demand of wood products.

is the demand formula for wood.

is the supply formula for wood.

\(a, b, a_1\) and \(b_1\) are model parameters.

Through formulas 13 to 18, we can get the equilibrium price vectors of wood products of different diameter classes at the time \(t+1\).

\[
\text{P}(t+1) = (\text{P}_1(t+1), \text{P}_2(t+1), \text{P}_3(t+1), \ldots, \text{P}_i(t+1), \ldots, \text{P}_n(t+1))
\]

Based on the principle of market retrodict, we can see:

\[
\text{P}(t+1) = \text{FC}(t+1) \ \text{AP}(t+1) \ \text{C}(t+1)
\]
Where: $FC_{i(t+1)}$, $P_{i(t+1)}$, $AP_{i(t+1)}$ and $C_{i(t+1)}$ represent diameter class “i”, age class, equilibrium price, allowable profit margin, operating cost and depreciation respectively.

Operating cost and depreciation $C_{i(t+1)}$ can be determined through large-size sampling within a certain area. The respective shares of $FC_{i(t+1)}$ and $AP_{i(t+1)}$ can be calculated through profit margin $AR_{i(t+1)}$:

\[
\frac{PR_{i(t+1)}}{AR_{i(t+1)}} = \frac{FC_{i(t+1)}}{C_{i(t+1)}}
\]

From (22) we get:

\[
AR_{i(t+1)} = PR_{i(t+1)} \left[ FC_{i(t+1)} - C_{i(t+1)} \right]
\]

\[
\frac{FC_{i(t+1)}}{PR_{i(t+1)}} = \frac{AR_{i(t+1)}}{FR_{i(t+1)}} \frac{FR_{i(t+1)}}{C_{i(t+1)}}
\]

Through (24), we can get the price of different diameter class $FC_{i(t+1)}(i=1,2,3,...,r)$ at the time $t+1$.

If the state subsidizes ecological protection programs, the main purpose is to protect and maintain a good ecological environment. The marginal income of forest operators to reduce logging for profit maximization should be equal to the marginal income gained through government assistance for environmental protection. This means that marginal cost should be equal to marginal income. The marginal income for logging can be calculated through the above model, while marginal benefit for ecological protection can be calculated on the basis of the environmental protection function of forest resources, approaching equality of marginal income with marginal cost. Marginal cost here means the incomes lost by forest operators in giving up logging.

There is no available data of the environmental benefit function of forest resources. Even if such data were available, it would be difficult to get figures that can be added up directly because of the differences in environmental zones and people’s preferences. Therefore, we calculate the equilibrium of environmental protection and timber production by using one individual forest farm as a unit.

Take the Southeast Prefecture of Guizhou. The amount of state subsidies needed to reduce timber production during 2001 to 2009 is shown in Table 9:

<table>
<thead>
<tr>
<th>Year</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subsidy</td>
<td>4591.67</td>
<td>3974.17</td>
<td>3313.86</td>
<td>2653.55</td>
<td>2525.31</td>
<td>2397.06</td>
<td>2268.82</td>
<td>2140.57</td>
<td>2012.33</td>
</tr>
</tbody>
</table>

Table 9: State Subsidization Need for the Southeast Prefecture of Guizhou, 2001 – 2009
(Unit: RMB10,000 yuan)
Forest area will increase by 0.488 million hectares from 1.435 million hectares in 2001 to 1.923 million hectares by 2009; and forest coverage should increase by 18 percentage points from 53% in 2001 to 71% by 2009.

Forest resources have both ecological and wood usage functions. The ecological function requires the existence of forest resources, while logging is the prerequisite for wood usage. Now the state seeks the ecological benefits, whereas the producers or operators look for direct economic benefits. Therefore, it is necessary to develop a direct transaction between them, i.e. the state subsidizes reduction or stop of logging by economic means, with a view to attaining an equilibrium point between wood market and ecological protection.

8. Policy recommendations

8.1. Timber trade and development strategy

As the world’s second largest importer of logs, China depends heavily on the international market. China is also a country with great potential for forest development. For this reason, the choice of timber trade and development strategy will have a major impact on the sustainable development of the country’s forestry sector and wood-related trade activities.

Prior to or even beyond 2010, China will continue to import wood and related products. This strategy will help China reduce the consumption of its own forest resources, gain breathing space for the forest sector, accumulate a resource base for sustainable forestry development, place social benefits before economic benefits, and maintain a balance between the ecosystem and economic growth. However, China cannot forever depend on imports of wood and wood products to meet its total domestic demand, which would put China in an extremely passive position in terms of sources of imports, foreign exchange disbursements, inspection and quarantine and employment in the forest sector.

Since the forestry sector depends on forest resources, development is equally or even more important than trade policy and measures. Given the growing shortage of forest resources and intensifying competition worldwide, over-dependence on the international market will not be a wise policy. Acceleration of the development of the domestic forestry sector and continued increases in domestic supply capacities should be a key policy option.

8.2. Adopting a flexible trade strategy

For many years, China followed a one-sided export-oriented import and export strategy for wood and related products. In developing a trade development strategy for wood products, consideration should be given to domestic factors such as the availability of domestic resources and processing capacities, trade systems and structure, supply and demand, and international factors such as the pattern of international trade in wood, business cycle, price, exchange rate, trade barriers and movements of multinational corporations and economic integration organizations. In general, it will not be advisable to choose one strategy, as all strategies have certain advantages and disadvantages. There should be different focuses in different periods of time in light of the changing domestic situation and developments in international trade, to make them compliment and facilitate each other. At present, China’s forestry sector is characteristic of processing imported resources. Consequently, China should adopt an open export strategy by importing a lot of wood resources through multiple channels and exporting a lot of its special forest products such as rosin, tung oil, tea and bamboo products. When the economy is good, China should follow a strategy of importing resources and exporting products
through the international market. When the economy is in recession, China should continue to import resources from abroad but sell its products mainly in the domestic market.

This strategy will help China make full use of its existing production capacities. An industrial system dependent on imported resources is subject to the international business cycle and fluctuation with risks. However, with China’s reserve resources and the vast world market for wood products, we should be able to check the negative effects so long as we size up the situation correctly, take a flexible open trade strategy, overcome the temporary shortage of forest resources, and promote the long-term sustainable growth of the forest industry with the help of imports and exports while meeting domestic needs.

8.3. Intensifying development of fast-growing man-made forests

In the medium and long term, intensifying development of fast-growing man-made forests is a major approach to addressing the issue of protecting forest resources while meeting domestic needs for wood. China should accelerate cultivation of domestic forest resources, speed up development of man-made forests and forest farms for industrial use and improve the quality of forests, with a view to ensuring domestic supplies on a sustainable basis. Development of man-made forests should be guided by market demand and based on consideration of the needs and trade structure for wood.

8.4. Using state subsidies to exchange for protection of forest resources

It is a feasible approach to use state subsidies, including subsidies by central and local governments, to exchange for protection of forest resources. Developed countries and some developing countries have adopted similar approaches and achieved good results. China’s natural forests protection program is a wise policy option based on the experience from other countries. The Government invests about RMB10 billion yuan each year in the protection of the forests in the aforementioned areas, which is still insufficient. The case of Guizhou is somewhat typical and useful for a study of national scope. Given the regional differences across the country and unavailability of detailed data, it is difficult to calculate the figures for the whole country.

8.5. Paying attention to the potential negative impact of the WTO accession on forest resources protection

The potential direct negative impact of China’s accession to the WTO will probably come from the insects and pests that are brought in by import of some species and large quantities of timber and wooden packaging. Therefore, China’s inspection and quarantine agencies and other departments concerned should pay close attention to this issue, study it carefully and develop responsive policy and measures as soon as possible.
References:


